

















ON  
DEFORMITIES OF THE SPINE.



EXTRA SHEET TO ESTIMATE





W. Bagg ad. nat. del. et sculp.



ON

DEFORMITIES

OF

## THE SPINE.

BY

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## PREFACE.

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EIGHTEEN years have now elapsed since I ventured to publish a short popular *Treatise on the Nature and Treatment of Lateral Curvature of the Spine*, founded on some observations I had previously published in 1828, under the title of *An Essay on the Physical Education of Females*. Both these volumes having for some years past been out of print, I am induced to resume the subject; but, on the present occasion, propose extending the inquiry to the consideration of deformities of the vertebral column in general.

As there are numerous observations connected with the subject of *Lateral Curvature*,—the particular deformity of the spine to be first noticed,—that unavoidably partake of a popular character; and as this affection differs materially from those to be hereafter considered, I have been advised to divide the work into two parts, and to publish them separately, as well as together, that the general reader, if disposed to study this important subject, may not be obliged to purchase a volume unnecessarily large, and containing much that might be uninteresting if not wholly unintelligible to him.

At the same time, I beg it may be understood that no sacrifice of technical language has been made in any part of the work to meet the convenience of the non-professional reader.

No one who has studied the subject of spinal deformities, but must be convinced, that much yet remains to be acquired in regard to our knowledge of these affections, which, though of frequent occurrence, yet fall into the hands of comparatively few practitioners. The objects of them among the poor are seldom received into public hospitals (if the infirmaries attached to the various poor houses be excepted), on account of the length of time requisite for their treatment, which would deprive so many other deserving and afflicted persons of the benefit of these charities, to an extent that would necessarily limit their utility, and defeat the purpose for which they were more especially instituted—the relief of acute disease. Hence, the student seldom has his attention called to the study of cases of this description, and he very generally enters on the duties of his profession with little or no practical knowledge respecting them. We cannot therefore feel surprised, that we daily meet with men, eminent in their profession, and of extensive general experience, who are ignorant of the difference existing between one kind of spinal deformity and another, of even opposite natures; and who, it may fairly be presumed, do not the less confound those which bear some resemblance to each other. In more than one instance, I have known angular projection,



originating in loss of substance from ulceration of the vertebræ, treated by gymnastics, at the imminent hazard of destroying the patient, and with the certainty of materially aggravating the disease. An example of the same affection, treated by mechanical extension, wherein complete paraplegia was the result, has also occurred in the course of my practice; and terminated, as might be presumed, fatally.

It is by no means uncommon to find lateral curvature treated by absolute rest, leeches, caustic issues, and the establishment of debilitating discharges,—when free and vigorous exercise in the open air, and the adoption of every measure calculated to impart health and strength to the system, are demanded. I have known the irregularity of the spine and deformed ribs, consequent on the falling in or contraction of the parietes of the chest, proceeding from collapsed lung, (after the operation of paracentesis thoracis, for the cure of empyema), to be subjected to a discipline proper for lateral curvature. I have also known a case of unusual incidental enlargement of the spinous process of the seventh cervical vertebra, treated for “angular projection” of the part, such as would be produced by caries of the body of that bone. And it has happened, that to cure the reflected spinal irritation, and the accompanying inclination of the spine forwards, which occasionally occur in calculous, or other chronic disease of the kidney, the loins have been cauterized, on the presumption that the patient was suffering

from subacute inflammation of the theca vertebralis. These, and similar equally important mistakes, are of frequent occurrence; and even men who have devoted considerable time to the inquiry, and had the advantages of tolerable experience in the treatment of spinal deformities, are not wholly exempt from their commission.

Another and important error, committed by persons not conversant with the nature and variety of these deformities, is the observance of an *exclusive* and *empirical* system of treatment, attended in many instances with the most serious and irremediable results. It will be evident, from what has been already advanced, that deformities of the spine are both various in kind and degree, as well as in the consequences they entail on their unfortunate victims.

The causes, whence distortions proceed, being in some cases constitutional, in others local, their effects are induced by very different modes of operation. Hence, no one system of treatment can be equally applicable to every case. Were it only empirics who fall into this error, it would be unworthy of notice, further than to guard the public against the danger; but unfortunately, in many instances, it is committed by those of whom different expectations might reasonably be entertained.

Doubtless, the several systems which different practitioners have adopted exclusively, are indebted for their celebrity to the success attending their employment in particular cases. By some, the rigid observance of un-

remitting recumbency for a series of years is insisted on ; or the patient is doomed to the reverse position (the prone) for a similar period. By others the very opposite practice is pursued ; and all deformities, of whatever kind or degree, are treated by drill and gymnastics. The mechanist places his faith in steel supports, springs, counter-pressure, and other similar resources of his art.

Productive, perhaps, of equal mischief with the empirical or exclusive system of treatment, is the opposite to it,—the *passive*, or that of non-interference.

To produce a desirable change when curvature of the spine of any kind is once formed, requires a good deal of attention and patient perseverance on the part of the surgeon, and more time than most men, who do not take a special interest in cases of this nature, are either inclined or able to bestow. It frequently also happens, that although the most judicious physical and mechanical means may be enjoined, they are rendered absolutely injurious for want of being properly directed during their employment.

The patient, it may be, is desired to keep herself, as much as possible, confined to a couch, or plane ; or, on the contrary, she is ordered to exercise herself, by climbing a rope, using dumb-bells, skipping backwards, turning a wheel, working a spring pulley, and the like, but without any definite and careful explanation of the principle on which these exercises are to prove useful : or, she is recommended to have recourse to steel stays, or other

supports, the construction and adaptation of which is left entirely in the hands of the machinist. The loss of time thus incurred is indeed a grievous evil; months and years roll on, the girl increases in stature, and also in deformity; and in proportion as she attains strength, and muscular energy, so does her calamity become confirmed and irremediable. Whereas, had due advantage been taken during the same period, while the general development of the body was in progress, to adapt and vary the means according to the particular exigences of the case, the spine might have been restored to its pristine symmetry, and much corporeal inconvenience, vexation, and disappointment, would have been prevented.

It is too much the practice, in palliation of this culpable indifference and negligence, to lament the inefficiency of the art. The fault, however, does not lie so much in the inadequacy of our means, as in the want of judgment and perseverance in their application. When from this advanced state, or apparently hopeless condition in other respects, these, as well as many other affections of a similar nature present themselves to our notice, such a plea may be admissible; still it is a duty to avail ourselves of resources, which, we are informed, on the testimony of men of credit, may aid our efforts at restoration, or prevent the further extension of the misfortune.

The constitutional influences whence spinal deformities proceed, often produce their effects by the most circuitous means, and are, in many instances, with difficulty traced

to their original source; hence hysteric affections of the spine are very liable to be misunderstood and regarded as proceeding from serious disease of the bones, or thecal membranes. Simple and easily-managed cases, indeed, of this description, are frequently subjected to the most painful and unnecessary discipline; while such as are important and require energetic treatment, are on the contrary often regarded as trivial, and allowed either to proceed to a hopeless extent, before the necessary means for saving the patient are resorted to, or are aggravated by the inappropriateness of the measures insisted on.

In country situations, or small towns, where men have but few opportunities of instituting inquiries on an extensive scale, we are not surprised that little should be known of the deformities in question. In this metropolis, however, not only does the immense population afford peculiar facilities for prosecuting any separate branch of medical research, but the museums belonging to the various anatomical schools and hospitals present a large field for pathological observation,—at all times open to persons anxious to avail themselves of such information. In this extensive city, moreover, we are comparatively free from those jarring interests, and petty jealousies, which beset and harass the country practitioner; so that every man who lives in harmony with his professional brethren may easily, if he choose, obtain opportunities, through the medium of the various public charities, of personally treating, or of studying the treatment of, almost



any variety of disease he may be anxious to investigate. It is highly gratifying to me to be able here to acknowledge the courtesy I have experienced from my professional brethren in this respect, — many of whom have afforded me opportunities of the most valuable kind, and of which I have not failed to avail myself.

It is usual with most writers on medical subjects, before describing the diseases of any particular organ, or part, to prefix a general outline of its anatomy. Such a preliminary, in the present instance, has been dispensed with, as sufficiently ample accounts may be found of the structure and constitution of the spine in any of our anatomical works. I have, therefore, satisfied myself by introducing only such brief anatomical and physiological remarks as have appeared to me necessary for the purpose of explaining the pathological changes induced; or as were calculated to render the principles of treatment intelligible.

For the use of many of the specimens from which the wood-cuts were delineated, — especially those illustrative of diseases of the *Vertebræ*, Part II, — I have to express my obligations to the Treasurer of St. Thomas's Hospital; in the Museum of which Institution the originals may be found. I have also to acknowledge the valuable assistance afforded by numerous professional friends, who have favoured me with the loan of preparations for the same purpose. The wood-cuts and engravings were designed and executed by the Messrs. Bagg, of Gower-street, whose reputation, as correct and skilful anatomical

draughtsmen, is too well known to require any commendation on my part; but I avail myself of this opportunity to thank those gentlemen for their great attention to my wishes, and to commend the fidelity with which they have executed the task imposed upon them.

The outlines of the *cases* were taken by the aid of a camera lucida.

E. W. DUFFIN.

1st February, 1848.

14, Langham Place, Cavendish Square.

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ON  
DEFORMITIES OF THE SPINE.

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CHAPTER I.

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INTRODUCTION.

NEGLECT OF DEFORMITIES BY THE EARLIER SURGEONS—REASONS FOR THE SAME—THE MECHANICIAN IN CONSEQUENCE INJUDICIOUSLY APPLIED TO—INSUFFICIENCY OF MECHANICAL MEANS ALONE TO EFFECT A CURE—GREATER PREVALENCE OF DEFORMITIES IN CIVILIZED LIFE—ERRORS OF EDUCATION—GENERAL OBSERVATIONS ON THE PHYSICAL EDUCATION OF YOUNG LADIES—EVILS ARISING FROM TOO EARLY MENTAL CULTIVATION—EXERCISES CALCULATED TO PREVENT THE SUPERVENTION OF DEFORMITY—CALISTHENICS—DANCING—DUMB-BELLS—WOODEN CLUBS, OR SCEPTRES—DOD'S BALL EXERCISE—ROPE WALKING—LADDER EXERCISE—BALANCING UPON THE HEAD—PASSIVE EXERCISES—FRICTIONS—HAIR GLOVE—KHEESAH—FLESH BRUSH—SHAMPOOING—SIR ASTLEY COOPER'S CHAIR—RECLINING CHAIRS—RECUMBENT POSITION—INCLINED PLANE—CRUTCHES—ORTHOSPINALIS—BACK-BOARDS—BRACES, ETC.—SKIPPING—THE GAMES OF LA GRACE AND LE DIABLE BOITEUX—HOOP—BATTLEDORE—BALANCING UPON THE HEAD FURTHER CONSIDERED—EFFECT OF WEIGHTS SUSPENDED IN FRONT OF THE BODY—POSITION OF A CHILD IN THE NURSE'S ARMS—AT SCHOOL—IN BED.

It is not a little remarkable that, until within the last half century, deformities of the spinal column may be said to have almost escaped scientific investigation. The older surgeons, it is true, devoted no inconsiderable attention to the subject;

but, being totally ignorant of the real nature and causes of the several varieties now known to exist, their treatment, except in a few instances, was of necessity empirical. Even at the present day an opinion prevails that the cure of spinal deformity comes rather within the province of the mechanist than of the surgeon; and, doubtless, were a familiar and practical knowledge of the simple laws of physics, the only, or even the main desideratum, the mechanist might, in the majority of instances, prove perhaps the more successful practitioner.

The spine, however, is not a piece of ordinary mechanism, the several parts of which might be devised and adjusted by a common artizan, but a column of intricate workmanship, endowed with vitality, and destined to perform a variety of important offices in the animal economy. This structure, moreover, is incessantly undergoing changes that not only exert a powerful control over its development, but render it liable to disease of various kinds; hence, its distortions cannot be remedied on exactly the same principles, nor by the same mechanical means, as would be found successful if applied to the straightening a piece of bent metal or warped timber. In the treatment of some cases of spinal curvature mechanical resources are, doubtless, not only highly proper, but indispensable; while in others they are wholly inad-



missible. Yet under no circumstances ought such means to be trusted to alone. Deformity, in some instances, arises from partial, ill-directed, or perverted muscular action. In others it supervenes as the result of changes effected by the ravages of destructive disease; and, so produced, is liable to assume its most serious and repulsive forms.

Of how little avail is the mechanist's art in arresting destructive ulceration of the vertebræ in scrofulous disease of these bones! Or, how disastrous the effects of resolutely attempting to straighten an anchylosed spine, deformed from such a cause! The truth is, the practical skill of the mechanist should be rendered subservient to the science of the surgeon, and be guided by his knowledge of the pathology of the particular deformity.

Let us prosecute our inquiry a step further, and the medulla spinalis claims notice. The peculiar nature of this nervous centre, as well as the extensive influence it exercises upon the different parts of the body, render it not only a most interesting object of study, but call our attention to a consideration of the consequences that may proceed from deformity interfering with the healthy performance of its functions, as frequently happens when the misfortune is complicated with scrofula of the bones; and also render it questionable how far mechanical means may be proper, or require

modification, in the management of such cases. In distortions produced by caries, or other disease of the vertebræ, the medullary chord is liable to suffer from irritation,—to become inflamed,—to undergo disorganization,—to be compressed; or these morbid conditions may be co-existent. In such cases the physical disorder may be complicated with neuralgia, pains in the spine, or in distant parts of the body; with spasmodic twitching, or tetanic rigidity of the muscles supplied with nerves from the seat of disease; or with paralysis. All these phenomena demand attention equally as much as the deformity with which they are connected.

To treat distortions, then, with success, requires that the practitioner should not only be well acquainted with the mechanism of the spine, but be conversant with its physiology or the manner in which the various functions of the part are accomplished; and that he should have carefully investigated the pathology of every deviation of the column from its healthy form. Such a study is surely the province of the surgeon, and not that of the mechanician.

“Extremes often meet,” is a proverbial expression of common acceptation; and equally true is the corollary that may be deduced from this, viz., that similar results frequently flow from causes of apparently opposite tendency.

This truism is, to a certain extent, illustrated by the subject under consideration ; since high civilization, multiplied luxuries, inactivity, and indolence, from the enervation and morbid sensibility they induce, are as productive of the sources of spinal deformity, as are the opposite conditions of life, extreme ignorance and bitter want—even though the influence of these latter be aggravated, as they often are, by confinement to sedentary and unhealthy employments. But the pathological nature of the evil, and the *modus operandi* of the remote causes, in either state, are widely different.

The curvatures of the spinal column, which spring from sources that may be regarded as next to inseparable from highly civilized life, are of comparatively trivial importance, and, in a great many instances, to a certain extent, of a simply physical nature. The pernicious influences whence they arise, moreover, are generated from without the body, and usually succeed in producing their visible effects by primarily enfeebling the constitutional powers ; while those distortions which trace their origin to the influence of wretchedness and destitution are often repulsive to behold, painful in kind, and serious in consequence. The causes whence they emanate are primarily constitutional, and usually congenite or hereditary.

Let not the wealthy, however, flatter themselves that the higher ranks of society are exempted from such visitations: on the contrary; all that must be inferred from the contrast is, that the class of deformities last alluded to is not of so frequent occurrence among persons in the enjoyment of luxury and comfort, as among the indigent and wretched. Neither, on the other hand, are the poor by any means exempted from the minor evil, considered as the inheritance of the wealthy and more civilized portion of the community. For although, generally speaking, the variety of spinal deformity at present especially referred to, *lateral curvature*, is attributable to a faulty system of physical discipline pursued in early life, in order to attain the acmé of conventional refinement, yet it is by no means to be ascribed exclusively to the operation of this cause. For, notwithstanding the difference described, which often marks the sources of this affection as it prevails in the various ranks of society, there is a series of influences, to which a large class of the poor are exposed, which bear a very striking resemblance in their mode of operation to those which produce the same effects on their more opulent patrons. The analogy existing between the operation of the causes which tend to produce deformity among factory children,

and of those which exert their influence on the delicately educated female, is much more striking than may at first sight appear, and will be found to more than justify the humane interference made by Government in behalf of this numerous and ill-used class of the community. Their employment may be different; but its *modus operandi*, as regards the effect produced on the constitution, and the results thereof, are in many respects precisely the same.

Deformity of every kind, it is alleged, like disease in general, is more common in the present age than it was a century or two ago; and it is conjectured that, if we could take a retrospect of the ages of barbarism and ignorance which are passed, we should find the catalogue of disease to bear no proportion to that existing in modern times; and that were we to include savage life in the calculation, or, rather, to limit our comparison to this condition of man, the amount would scarcely equal a tithe of that which prevails in the intermediate state.

If this opinion be correct, may we not inquire whether the circumstance be not mainly attributable to the high state of civilization on the one hand, and to the extreme of destitution on the other, which prevail at the present epoch throughout Europe in a greater degree than at



any former period? But leaving the question of *actual* increase undecided, we may fairly assert that deformities are *apparently* more common in modern times, especially one variety — the *lateral curvature of the spine*. This affection, if it be not really more common, is certainly much more noticed than it was in the days of our forefathers, both by the professional and the non-professional observer. The sensitiveness of the human mind keeps pace with our increase of social refinement and general knowledge; hence, any deviation from the more ordinary standard of symmetry, especially in the female sex, however insignificant in degree, arrests more immediate attention, perhaps, at the present day, than it did formerly, and creates a proportionate amount of anxiety and solicitude in the minds of those interested in the welfare and future prospects of their offspring.

The uneducated labourer, or the working mechanic, thinks but little of any irregularity of form which does not incapacitate his child from earning his daily bread. We accordingly find that not only do the most serious examples of deformity present themselves among the poor and illiterate, but that such cases are more frequently permitted to advance, unregarded, beyond the possibility of restoration, than would happen were the

same amount of such disease to manifest itself among the higher ranks of society.

Neither is this indirect effect of civilization, or of its opposite state, limited to the human species. No sooner do we subject the brute creation to our domestic habits, or civilize them by diet, tending, breeding, and training, than they, too, lose their natural character, assume all the delicacy, and become the subject, as well as the sport, of the morbid excitement of artificial life, and obnoxious to numerous and complicated infirmities; so that while they perpetuate the constitutional delicacy and physical elegance they have attained, they in many instances entail disease and deformity, the very opposite of these, on their offspring. Deformities do not require to be hereditary, or to spring from a constitutional source, to be transmissible to offspring. Geoffroy St. Hilaire proved this to be the case in the lower animals in numerous instances.

Every person is conversant with the fact that a bent back, a wry neck, or a high shoulder, has been known to run for many generations in the same families, though no other hereditary constitutional peculiarity or disease could be traced in them. Nor is it more difficult to conceive that the bones of the child may resemble those of the parent, than that the lineaments of the face, and

the dispositions of the mind, may present an hereditary similarity. "It is a fact," observes Cuvier (speaking of the *Domestication of Mammiferous Animals*), "universally recognized, that the young of animals have a very strong resemblance to the individuals which have given them life. This fact," he remarks, "is as obvious in the human species as in any other; nor is it less true with reference to the physical qualities than to the moral and intellectual faculties. Now the distinctive qualities of animals of the same species—those which have most influence over their particular existence,—which in fact constitute their individuality—are those which have been developed by exercise, and whose exercise has been called forth by the circumstances amid which these animals have lived. Hence it follows that the qualities transmissible by animals to their young,—those which impart a mutual resemblance in them,—*are of a nature to arise from fortuitous circumstances*; and consequently that we are enabled to modify animals and their progeny within the limits which bound our power to produce the circumstances calculated to act upon them. With reference, then, to the human race, man thus obtains the privilege—not always the most enviable—of stamping upon his posterity a double identity, that derived from physiognomy applied to the development of the form

as well as to the features of the face ; and that of constitutional peculiarity and organic debility, varied according to the character of his habits and manners, and thus continually reflected, and transmitted to posterity." Man has, unfortunately, been regarded too much as a being whose habits and laws of life and perpetuity have little or no relation to those of inferior animals. Though the anatomy of animals, as regards the structure and mechanism of the body, has been extensively investigated and compared with that of man, yet the comparative animal economy of mankind and other animals, and comparative views of their states and manners of life, have been little regarded. "The pride of man," says a philosophical modern writer, "is alarmed in this case, with too close a comparison, and the dignity of philosophy will not easily stoop to receive a lesson from the instinct of brutes." Nor is it to the animal kingdom alone that such a change is confined; we trace it even in the vegetable creation. Do not plants, under the hands of a scientific cultivator, acquire qualities absolutely new?—a character they did not primarily possess—and are not these the result of fortuitous circumstances in the first instance, retained afterwards within the limits which bound our power to influence this development? In the human species pro-



gressive civilization, as manifested in manners and customs, civil and domestic, moral feelings and their concomitants, are the powers which operate on the temperament, increase the nervous sensibility, and often, through it, impair the physical organization, or even destroy life itself.

This opinion has been attempted to be controverted by a frivolous and ill-founded argument, that if defects of the person, not depending on constitutional disease, can be transmitted to offspring, we should daily hear of children being born without legs, arms, and fingers, of parents who have lost these members from accident or disease. But the cases are not parallel. In short, there is no similarity between defects which have *originally* been, or have *ultimately* become, constitutional, and those which, being accidental and local, do not affect the general vigour of the system. Besides, no one can deny that parents, whose peculiarities of form are known to be wholly independent of constitutional disease (as those consisting of certain defects in the number of toes, fingers, or limbs, or redundancies of the same), very frequently transmit such peculiarities through several generations of their descendants. But this question may now be considered as set at rest by Geoffroy St. Hilaire, who most satisfactorily demonstrated to the French Academy,



some years ago, that members never become deficient unless the nerve which supplies them has not been evolved.

In the bones, then, not only the form, but also the structure and degree of aggregation, may be similar in parent and child. If in the bones of a mother, during youth, the circulation has been languid, the consolidation slow and imperfect, or the form biassed by muscular action, it may reasonably be expected, at least under the system at present pursued in respect to the education of young ladies, that a tendency to these states of the bones will be developed in her children, *although she may be entirely free from those frightful constitutional diseases to which such a tendency is frequently ascribed.*

“In a wild state,” says Buffon, “animals rarely either miscarry, or produce monstrosities; while those which we denaturalize by domestication very frequently present instances of malformation.” Scrofula and rickets are not unfrequently met with among the inferior animals. Bicherod informs us that he found the ribs of an ox, that had been over-fed and pampered, in a soft and yielding condition. Duprey describes the skeleton of a rickety horse. The late Dr. John Mason Good assures us that the same disease occurs in the lion; and Comber has written a treatise de-

scriptive of it, as it appears among sheep. Mr. Pettigrew informs me that he has witnessed scrofula under a variety of forms, and to a considerable degree, in the simiæ confined in our menageries. Those who are conversant with the disorders of the farm-yard must have witnessed frequent examples of curvature of the bones, and swelling at the joints, in geese and ducks, when they have been much exposed to wet and cold.

It is, we are informed by Mr. Shaw, a curious, but well authenticated fact, that "chickens hatched by artificial heat are generally misshapen—one of the legs being often defective"; also, that animals which are badly fed, or over-fed, are especially liable to become deformed.\*

An enlargement of the joints is frequently met with in young pointers, and in greyhound puppies, when kept in confined and cold damp kennels. In pigs also it is common, and known by the name of krinkets.†

These facts are here alluded to merely as affording proofs of the bad consequences of any process of artificial rearing, which is at variance with the dictates of nature, whether as respects diet, habits, customs, or intellectual training. And al-

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\* Shaw *On Distortion of the Spine*, p. 39.

† *Encyclopedia of Medicine*.

though no one would be bold enough to deny that civilization is the greatest blessing mankind enjoys, and that to retrograde in knowledge, even were this desirable, would be impossible; still, we cannot but deplore that, whilst eagerly engaged in cultivating the intellectual powers, we seem, to a certain extent, to forget,—or, at least, not to take into due consideration,—that man has also a body to be cared for, on whose integrity and energy the vigour of the mind may be said materially to depend; and that by unskilful management, not only may disease be generated and deformity produced, but even life itself may be sacrificed.

I have been led into prefixing these observations by the fact that spinal deformity, particularly one of its most common varieties, is, in very many instances, essentially connected with the neglect or mismanagement of the physical powers during early life. *Lateral curvature* of the spine, prevalent among the female sex of a certain rank in society, is in a great measure attributable to this cause.

The modern system on which the intellectual and physical education of young ladies is conducted, especially if highly finished and accomplished, is in accordance with certain conventional forms, habits, and customs, inconsistent with that

degree of invigorating and regular exercise which is absolutely necessary to the full conservation of health. In denouncing the system, however, let me not be understood as desirous of attaching blame to those who are charged with the responsible duty of carrying out practically its arbitrary and injudicious precepts. The greater number of teachers and superintendents have little or no control over the system they are compelled to pursue. They are, doubtless, in the majority of instances, actuated by the purest and most laudable motives, and anxious for the welfare and improvement of those committed to their care. When they err, they do so innocently; and, in the discharge of their duty, are often unconscious that the discipline they enjoin is in any way calculated to prove injurious. Some there are, however, who are fully aware of the baneful tendency of the general plan, without having it in their power to remedy the evil; and who, therefore, may be said to err from compulsion. It would be in vain for an individual to attempt to stem the current of fashion and popular prejudice, or to resist forms and customs imposed by the etiquette and demands of society. The advancement of civilization, we are told, has rendered certain restrictions requisite for the protection of the morals of the age in which we live. Be it so;

we can only lament that fashion does not also make provision that her laws and restraints, in matters of such vital importance, should be in accordance with reason and common sense; and that those who refuse to subscribe to her capricious maxims should be denied her protection and patronage. If, therefore, unhappily, we have no means of checking the evil, we must endeavour, as much as is in our power, to obviate or remedy its pernicious consequences.

Besides, it must be borne in mind that teachers are further constrained to adopt and pursue whatever plan popular prejudice may insist on. Their professional reputation and pecuniary interests are at stake; failure in the object of their ambition is ruin; success clears the path to eminence and fortune. Their exertions, moreover, are stimulated by the keenest competition, and each candidate exerts every effort to shew how large a *quantum* of knowledge and how many accomplishments she can impart to her pupils within a limited period.

Such rivalry, though in itself highly commendable, is unfortunately calculated to inflict inconceivable injury on those subjected to its influence, as we shall easily perceive, if we reflect but for a moment on the effects likely to be produced by it on a young person of delicate constitution, whose



physical powers are feeble, and whose brain may be unable to respond to such repeated or continuous calls for mental exertion. Nor does over-strained application in reality accomplish the purpose for which it is designed. Doubling the force does not, under these circumstances, by any means double the effect. "Pour water hastily," says Quintilian, "into a vessel of a narrow neck, and little enters ; pour it gradually and by small quantities, and the vessel is filled." Boys, it may be argued, are now-a-days confined as closely to their studies as girls, and do not suffer in the same manner in consequence. Admitting this for the sake of argument to be the case, they are not subjected to any unnecessary or injurious physical restraint during school hours, and even if they were exposed to any such influence, the bad effects that might otherwise arise from it would be wholly counterbalanced by the vigorous and active amusements in which they are permitted to indulge during the hours of recreation.

On reflection, however, it will appear that not only are boys not confined so closely to the school-room as girls, but that a much longer period of their life is devoted to the acquisition of rudimentary knowledge.

In the first place, they do not learn so much in proportion during school-life as girls.

Secondly, the studies of the boy, destined to be fully educated, only in fact begin when those of the girl terminate. It is true, they may both leave school at about the same age, but then the former goes for three or five years to an university, while the latter usually enters at once on the routine of life. At the age of eighteen years the young lady is introduced into society and, from that time, in general, regular study ceases.

But let us not overlook the difference in the sexes. At the age of eighteen or nineteen, the mental energy, capacity, and memory of a young man are equal to any task he may impose upon them, within the scope of his abilities; and his physical frame is developed in proportion: he has passed the first critical period of his life—that which intervenes between youth and manhood. From the thirteenth to the sixteenth year, on an average, is the corresponding period in females; and in them (in a great measure attributable to the previous sedentary nature of their occupations and amusements) this period is one of feeble health, and considerable physical debility. It is the *transition* age of life—the period at which those changes are being established that constitute womanhood—an epoch at which the power of resisting the invasion of physical infirmity is comparatively feeble, and the animal frame, as well as

the mind, most sensitive and susceptible of impression. It is an epoch, moreover, when hysteria, a notable agent in fostering spinal debility, is most liable to supervene;—when anæmia, chlorosis, and other disorders of the assimilative and secretory systems are prone to declare themselves in those of delicate constitution, and materially to operate on the corporeal powers; at this period of life, likewise, hereditary rachitic feebleness of the physical and vital powers, and tendency to natural debility, are liable to be revived, and to induce a condition of the vertebral column calculated in an eminent degree to favour the formation of curvature.\* The digestive powers in such cases are weak, and liable to derangement from trifling causes; the assimilative functions are imperfectly and slowly performed, and the evolution of the physical organization in general is more than usually tardy. When, therefore, such young per-

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\* When rickets occur at an early age, as this disease usually does, the bones of the extremities and of the skull are those principally affected; and there exist, moreover, certain constitutional indications diagnostic of the rachitic diathesis. But when the disorder does not declare its presence in a local manner till a later period of life, not only may the constitutional *indicia* be entirely wanting; but the most frequent seat of the local affection is the vertebral column—the bones of which, as well as the ribs, it softens, and may thus give rise to serious and complicated deformity.

sons are exposed to the influence of powerfully-exciting agents, deformity may rapidly assume a frightful extent.

How ill-fitted, then, is this period of life to be that in which the most active mental exertions are made, and the greatest restraints imposed. To the physical mismanagement of this critical period, in numerous instances, are we to attribute not only deformity, but the development of hysteria, consumption, scrofula, and similar diseases, which often persecute their victims for the remainder of life.

However much, then, we may espouse or defend the cause of ultra-civilization, and countenance all its innocent vagaries, we cannot but deplore that it should be accompanied by a system of discipline and etiquette so rigid and overstrained, as not to allow a young and artless growing girl, from six to fourteen years of age, those invigorating and heartfelt recreations and pastimes, which are alone calculated to secure her health and immunity from the miseries just depicted, without the imputation of vulgarity, or the accusation of levity. A tame, heartless, inanimate walk does not duly exercise the body at the age alluded to. Neither do amusements, squared by the line and rule of artificial decorum and conventional ceremony, afford that stimulus and excitement to the

circulation which is essential to a healthy development of the frame.

Early life demands recreations in which the heart is engaged as well as the body : the stimulus must be mental as well as physical to produce the desired end.

But as the cause and effects, in many instances, do not bear a very direct relation to each other, the former is apt to be overlooked, while the latter, being with difficulty traced to their respective sources, are liable to be injudiciously treated.

Besides, it may be fairly questioned whether unnecessary restriction and moral severity at an early period of life do not engender the very reflexions we are so anxious to exclude.

The youthful mind is ever curious and inquiring, and rests not, when subject to control on account of apparently trivial causes, till it arrives at some satisfactory explanation of the mystery.

Why infuse into the mind of the child of tender years, when no reason for the caution can be assigned or understood, the preposterous notion that at the age of fourteen or fifteen she must resign all her natural ebullition of mirth and gaiety, which, however admired in the artlessness of childhood, might at a subsequent period of life be construed into expressions of levity and folly ? The instincts and passions which then take pos-



session of the soul gradually of themselves unfold the laws of natural decorum and modesty ; and a girl of well-constituted mind, whose education has been properly conducted in other respects, will require very little moral tuition, if well timed. When such an one falls into error, it may be doubted whether any system of discipline, however early commenced, would have led to a happier result. But it is unnecessary to pursue this subject further ; it will be fully understood when that kind of spinal deformity, which has received the appellation of lateral curvature, has been inquired into.

The ignorance of the multitude, and the occasionally unguarded and highly reprehensible remarks of medical men, have unfortunately concurred in ascribing all physical infirmities to the influence of certain hereditary constitutional maladies, the very names of which are never heard without abhorrence—a circumstance in the present instance particularly to be regretted, as the prevalence of such a feeling often prevents the sensitive from exposing, even to their dearest friends, that which they have been erroneously led to consider as a stigma on their family or forefathers ; and thus the wholesome counsel of the better informed, which might solace their morbid sensibility, and encourage them to resort to scientific aid, is either never sought, or is de-

ferred till too late to prove of any service. The primitive existence of a condition of the constitution, such as above referred to, is by no means indispensable to the induction of deformity, and is, fortunately, as regards the most common form of spinal irregularity, of comparatively rare occurrence. A state very analogous to hereditary constitutional disease, however, is often generated by the confinement, impositions, and arbitrary restrictions just alluded to ; and may be said to be produced antecedently in a greater or less degree in almost every case of lateral curvature, as this deformity, in the majority of instances, presents itself to our notice.

The great demand made at the present day on the mental powers of youth of both sexes, especially the female, is deserving of our most serious consideration. Numerous as are the intellectual attainments and accomplishments which usually enter into what is regarded as a complete system of education, it may be safely affirmed, that they might be all acquired, without any sacrifice of health, by a systematic adjustment of position, arrangement of time, and methodical management of recreation ; by which, in most instances, would be conferred the inestimable blessing of a sound and vigorous mind, conjoined with a healthy and well developed body. *Mens sana in corpore sano.*

To effect these ends, however, we must not forget that in the philosophy of education, increasing the power does not always increase the effect. The second hour of study is seldom half so good as the first; the third is much worse than the second: and there is, in fact, no little truth in the remark of the child, that "it forgets in the fourth hour what it learnt in the first." The effective part of study, after a certain time, decreases in proportion to its duration. Students in university classes find an hour sufficient to devote exclusively to one subject. That which delights at the commencement becomes irksome and tedious if the application be prolonged beyond a moderate limit, and soon induces a feeling of exhaustion. The same effect results when the attention is kept too long fixed by any public exhibition. It follows, then, that time is actually lost, when consecutive hours are devoted, without relaxation, to mental pursuits. The time thus wasted, if spent in recreation, would be more than sufficient to allow of the mental powers being fully renovated by the period at which, under ordinary circumstances, the jaded scholar leaves off study. Experience teaches us, besides, that nothing would be lost by this intervention of amusement, but that an actual accession would be made to the acuteness of the individual.

This reasoning applies also to another very material point as regards the evolution of the physical and intellectual powers—the making too early a call upon the mental faculties. It may fairly be questioned whether scholastic tuition does not, in most instances, prove rather injurious than beneficial to children before the attainment of the *seventh* year of their age. It may be argued that many prodigies have astonished the world before the completion of their fourth year. We do not, however, often find that the intellectual powers outstrip the growth of the frame ; but, on the contrary, that they increase in strength, as the body increases in vigour and magnitude.\* From this correspondence between the powers of the mind and those of the body, it is highly probable that the brain and nervous system—the organs of thought and volition—are not prepared for continuous exertion

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\* This, of course, must be understood to apply within certain limitations only ; since there is every reason to believe, that the mental principle, as well as the vital movements, have relation to certain physical proportions in size as well as form. The latter appear to execute themselves with a rapidity the inverse of the magnitude of the animal ; and what large animals gain in force, they lose in agility and address. The application of this principle has been made to the female part of the human species ; and the circumstance of women having forms so much smaller and more delicate than the male, has been deemed one cause of their greater precocity and mobility.

of these functions at a very early age. The infant mind is incapable of close reasoning, or of being occupied by the numerous and more complicated relations of our sensations and ideas to one another. It is unnatural to the brain, at an early period, to be much exercised for these purposes. Such exertions demand a rapid supply of nutritive blood to the organs used. A supply of blood, however, so afforded, is very prone to lay the seeds of disease in the structure of the organs themselves, to be fostered by the first genial coincidence.\* Hence, it must be better to make only such calls for exertion on the mental powers as can be answered without destroying the balance of the circulation throughout the system.

A particular talent manifesting itself at an early period of life, may, in some instances, perhaps, be cultivated to a certain extent with impunity; as its culture, being a gratification to the individual, may be presumed to be a healthful recreation, without being attended by undue mental exertion: but, unfortunately, in too many instances, advantage is taken of precocity, and that which was designed as a blessing is converted to the opposite.

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\* As hydrocephalic inflammation. It is a remarkable fact, that precocious children are the most frequent subjects of this disorder.



To cut off the source of a delight so pure as that which thrills through the bosom of a parent, while encouraging the early expansion of the intellect of his child, may appear harsh and unnecessary : but we should ever bear in mind that what is unnatural is not lasting ; and that they who foster the blossoms, which are the precursors of spring, and not its products, gather little but disappointment.

The popular notion is not devoid of foundation, that generally—nay, almost universally—precocity is either the symptom, or cause, of physical debility, not unfrequently stunting the natural growth, or producing deformity in after life, or even shortening the period of existence. Of this our immortal bard avails himself in his tragedy of *King Richard III*, when the Duke of Glo'ster observes of the young Prince Edward :

“ So wise, so young, they say, do ne'er live long.”

We know that fruit, bearing many of the appearances of ripeness, is not unfrequently found to have been blighted ; that a plant by being forced, is generally deprived of its vigour ; and that women, in countries where they arrive prematurely at womanhood, are as prematurely visited by old age. The number of persons who have realized any remarkable promise of childhood is

singularly small ; a fact for which it would not be difficult to suggest a reason, were this the place adapted to such a discussion. If, therefore, we urge too hastily the instruction of the mind, neglecting to lay a solid foundation of bodily health, we incur the risk of depriving our children of both these blessings. The weak are certainly further weakened, and the strong are as certainly not further strengthened, by the too early exertion of their faculties. In short, premature genius, or talent, should rather be repressed than encouraged. Teachers are so thoroughly aware of the progressive diminution in the powers of memory and attention, from long application to one subject, that they in general endeavour to avoid inducing it, by changing the object of study. Hence, in many seminaries, the same young person is often called upon to attend five or six different masters in the course of the day. The mental fatigue undoubtedly is, by these means, materially relieved ; but still exhaustion is produced ; as any one may experience who studies long, however varied or agreeable be the objects of his attention. Were such effects avoided, by shortening the periods of study—by interposing frequent intervals of vigorous, agreeable, recreative exercise—the apprehension would be more acute, the conception more clear and distinct, and the memory more retentive.

Great importance has always been attached to exercise in the preservation of health, even from the remotest antiquity, because the most beneficial results have ever been observed to flow from it. Nor will this continue matter of surprise, when we reflect on the intimate connexion that subsists between the muscular system, and the nervous, vascular, and respiratory functions; and how powerfully these operate on each other. While, on the one hand, the muscles derive their energy and activity from the influence of these functions, they, on the other, by their action, invigorate the organs whence these operations proceed, and thus contribute to their healthy development. The muscles themselves also acquire strength by exercise.

Exemption from many diseases among the middle ranks of society may be regarded as the reward of industry, temperance, and frugality, conjoined with the demand for bodily labour imposed on them by their necessities.

As at present constituted, the recreations and amusements permitted to girls in the middle and higher ranks of society, are monotonous, insipid, and heartless,—of a nature not at all calculated to excite emulation, or any of the higher emotions of the soul. Being restricted, by the awful importance attached to certain rules and principles sanctioned by the customs of society, they gener-

ally demand only a limited degree of exertion. They are, in fact, rather exhibitions than recreations. There is not gained by such pastimes that gladdening of the heart requisite to relieve the wearied mind; the whole amusement scarcely amounts to more than a change of labour. Girls, therefore, when left alone, often prefer singing or conversation to exercises devoid of meaning or interest. These, and similar privations, are "lady-like"!—because all ladies are subjected to them. But this is merely allowing the folly of fashion to prevail in spite of reason.

No artificial means can be regarded as substitutes for vigorous and animating exercise, which alone can preserve the frame of the body perfect in its symmetry. Young people have a natural propensity to activity; it is, therefore, an ill-judged policy to curb, on every trifling occasion, the natural and buoyant spirit of young girls, as though it were inconsistent with that delicacy and refinement which should characterize the sex. "It is to be hoped," observes a judicious modern writer,\* in treating of the beneficial effects of exercise, "that the period is not far distant, when, amidst the many and real improvements in education, more attention will be paid to this important

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\* Dr. Marshall Hall *On Diseases of Female Youth*.

point. In every system of education at female seminaries, as well as at boys' boarding-schools, a plan of regular and active exercises should form an essential part; the want of exercise not only leads to general feebleness of the frame and of the mind, but it frequently sadly interferes with the growth and development of the form." Young ladies should not be confined in the school-room during so many consecutive hours, as is the practice at most modern seminaries. The intervals for play or relaxation, if not somewhat more prolonged, should be of more frequent recurrence. Girls should be encouraged to engage earnestly and with spirit in such exercises and games as are suited to their sex, and appear best calculated to prove beneficial in developing the form of the body.

To this end an occasional walk, under the eye of the governess, or a ride in a carriage, is not sufficient; and is in fact little more than an apology for exercise.

Carriage exercise, indeed, being passive in its nature, is calculated for convalescents, rather than for young persons in full health and vigour. Bodily exertion, unless combined with mental amusement and exhilaration, produces comparatively little beneficial influence in the development, or even in the maintenance of the physical



powers. Horse exercise, when practicable, is the best, as it occupies both mind and body in a proper manner. When there exists any tendency to lateral inclination to the right side, the lady should sit on the off side of the horse; or do so on alternate days, as may be deemed most desirable.

The extent to which want of exercise is carried, in many boarding-schools, will appear incredible to those who have not personally investigated the subject. The following *carte* of a young ladies' seminary, drawn up by Dr. Forbes, and published in the *Cyclopædia of Practical Medicine*, is well worthy of notice:—

“At 6 in the morning the girls are called, and rise.

“From 6 to 8 learning or saying lessons in school.

“8 to  $8\frac{1}{2}$ , at breakfast.

“ $8\frac{1}{2}$  to 9, preparing lessons out of school (some of the girls permitted to do so in the garden).

“9 to 1, at various tasks in school.

“1 to  $1\frac{1}{2}$ , out of school, but must not go out of doors; reading or working, and preparing for dinner.

“ $1\frac{1}{2}$  to 2, at dinner.

“2 to 5, in school, at various tasks.

“ From 5 to  $5\frac{1}{2}$ , at tea.

“  $5\frac{1}{2}$  to 6, preparing to go out ; dressing or reading or playing in school.

“ 6 to 7, walking, generally arm in arm, many with books in their hands.

“ Two days in the week they do not walk in the evening at all, being kept in for dancing ; but by way of amends, they go out on two other days, from twelve to one, and then they miss writing. It is to be remarked, that they never go out unless the weather is quite fine at the particular hours allotted for walking. They go to church all the year round twice every Sunday, on which day no other exercise is taken.

“ From 7 to 8, for the older girls, reading or working in school (this is optional), and then prayers ; for the younger, play in school, and prayers.

“ At 8, the younger go to bed.

From 8 to 9, the older reading or working, as before.

At 9, to bed.

“ Twenty-four hours are thus disposed of:—

In bed (the older 9, the younger 10)	<small>HOURS</small> 9
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In school at their studies and tasks	9
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In school or in the house (the older at optional studies or work ; the younger at play)	$5\frac{1}{2}$
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At meals	11½
Exercise in the open air	1

“The above account was taken from a second or third-rate school, and applies more particularly to the season most favourable for exercise—summer.”

*Calisthenics* form a class of exercises, in many instances, highly to be recommended. When first introduced into this country, under the title of gymnastics, they were of much too athletic and violent a kind, and more suited for young men than girls; but by judgment and experience, they have been at length reduced to a series of graceful, dignified, and natural movements, admirably adapted to promote an equable evolution of the physical powers, and to call into action, in regular succession, every part of the muscular system. In the prevention of deformity, these exercises, properly conducted, are invaluable; and by their influence on the general health, through the medium of the muscular system, have in numerous instances wherein obliquity had actually taken place, alone sufficed to remedy the evil.\*

*Dancing*, from combining the advantages of exercise with those of agreeable and exhilarating

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\* For a full description of *Calisthenics*, the reader is referred to Donald Walker's *Ladies' Exercises*.

recreation, is not only extremely useful, but well calculated to prove eminently beneficial in favouring a symmetrical development of the frame. In the acquisition of this accomplishment, however, for reasons that will presently appear more obvious, strained irksome attitudes ought to be avoided as much as possible; and the exercise should not be continued beyond the commencement of fatigue, but immediately changed for a state of repose, more especially as regards the muscles of the spine. Unfortunately, those who in general undertake to instruct in dancing, from the position they usually occupy in life, and the nature of their early education, have never been led to study the subject in a scientific manner, (by which I mean physiologically), and are hence seldom sufficiently aware of the injurious consequences that may proceed from over-stretching the articular ligaments by exercising the body and limbs in unnatural positions; such in fact as can only be maintained by a forced, nay sometimes even painful, action of the muscles. It is true that irksome strained attitudes are not so much insisted on at the present day as they were a few years ago, unless in the education of professional dancers; still, however, they are considered essential by some professors, and regarded as the only practice that can enable the pupil to attain a thorough command over the

person in executing the more simple movements of ordinary life,—the only object, in truth, for which dancing is taught to the non-professional person. When such fatiguing strained attitudes and movements are insisted on, it must very often happen that the weight of the body is thrown upon parts not naturally intended, and consequently not calculated, to support it; and, what is perhaps of still more importance, from the undirected nature of the exertion required, not sufficiently under the control of the will. Serious consequences from this cause are not of such rare occurrence as may be supposed. Among these may be mentioned injurious extension of the articular ligaments of the tarsal bones, as well as of the hip and knee joints, so that they never afterwards recover their healthy resiliency. When the energy of the muscles, moreover, has become enfeebled by fatigue, these organs either neglect their duty, or become incapable of performing it, and such muscles as have not been called into action may thus operate injuriously with double effect. On a similar principle we may explain the serious consequences that occasionally follow certain sudden *involuntary* muscular efforts. The heel, for example, may slip in going down stairs and cause fracture of the knee-pan—a result that could not proceed from any voluntary action of the muscles attached to the patella, because the



parts acted upon—the resisting powers—are, in such case, as fully prepared to receive the impulse, as the organs by which the impulse is communicated.

For these reasons, dancing, as well as calisthenics, if taught on rational principles, would include no movements that exceed the limits fixed by nature to each particular joint. This, in reality, is the true boundary of elegance and grace. All movements or attitudes that go beyond these limits may be wonderful, but they are neither graceful nor elegant; and are always achieved at some sacrifice of the physical structure of the parts concerned in them. The requisite exertions, moreover, should be performed with gradually increased power, and alternated with rest in postures calculated naturally to afford it,—such as are unattended by muscular effort for their continuance,—otherwise they do not fulfil the intentions indicated.

It is desirable in dancing that the arms should be used as much as possible, in order that they may be developed and strengthened equally with the lower parts of the body. With this view some teachers very judiciously require the performance of certain calisthenic exercises, previously to the commencement of the ordinary lesson. Dancing cultivated to excess, is very apt to injure the finer proportions

of the limbs, by developing too fully those parts more particularly called into action. Thus in our best opera dancers, the ankle and calf of the leg are often clumsy and herculean, while their arms appear, in comparison, to be imperfectly developed. On the other hand, the limbs of those who practise horsemanship and tumbling are usually well proportioned, because the exertions of such persons are not confined to the lower extremities, but bring all parts of the body equally and alternately into play. Professional dancers, especially those who practise the *tours de force* necessary to successful stage effect, are seldom remarkable for grace in any of the ordinary movements of life. In the performance of these they are generally constrained, formal, and automatic. The bad effects on the form of the foot, resulting from overstretching its ligaments, have already been alluded to. Very few opera dancers can boast of a good instep off the stage. When the foot is placed on the ground, and no effort made to retain its form, the arch of the instep yields to the weight of the body and allows the concave part of the sole to rest on the same plane with the toes. When, therefore, such persons walk, they never rise on the toe, nor bend the foot. From their habit, also, of turning the toes very much outwards, they acquire a peculiar shambling gait, usually denominated "a strut"; by the

Scotch, "shailing,"—a term more appropriately applied to walking sideways.

These observations, it need scarcely be remarked, apply more especially to the bad effects of dancing practised as a science, when, consequently, the movements are carried beyond the natural limits. They at the same time, however, serve to point out how questionable is the propriety of devoting much time to this accomplishment, with a view to the attainment of more than graceful and natural habits of motion.

*Dumb-bells.*—The exercise of the dumb-bells forms a portion of school discipline in almost every seminary for the instruction of young ladies. The dumb-bells ought to be used regularly once or twice a day, for the continuous space of five or ten minutes. They should not weigh more than from three to four pounds each, for children from six to ten years of age; and from four to six pounds, for those from ten to fifteen. Every school ought to be furnished with several pairs of these bells, varying in weight. An explanation of the proper mode of performing an exercise so common, however superfluous it may appear, is by no means unnecessary. I have seen girls, who have been accustomed to use the dumb-bells at schools, swing them in an exceedingly injurious manner; poking forwards the head and neck at each alternate

movement of the body in a manner calculated to render the exercise worse than useless.

To use the dumb-bells with advantage, the young person should stand in the first drill position, place the heels together, and point the toes slightly outwards. The bells being then grasped, one in each hand, are to be raised simultaneously towards the front and centre of the chest, and approximated, so that the corresponding balls of each bell may touch each other. They are then to be projected horizontally forwards, but not forcibly, to the full length of the arms, and allowed to drop with sufficient force to swing them gracefully round the body. The arms should be rotated somewhat outwards in their course downwards, so as to make the balls on the distal, or thumb side of each hand approximate or strike each other behind the back, the elbow joint being retained throughout as straight as possible. The weights are then to be again brought round, raised to the front and centre of the chest, and propelled in the same manner as before for twenty, thirty, or any number of times that may be deemed necessary.

The common fault, in using the dumb-bells, consists, either in the non-observance of a proper position of the body generally, in not turning the arms outwards as they are swung round the body, or in

rotating them inwards. Any one of these faults causes the young person to elevate the shoulders in endeavouring to make the balls strike each other behind the back; and, at the same time, forces her to thrust forwards the head and neck, and thus defeat the purpose for which the exercise is designed.

Another mode of exercising is, slowly to raise the weights at the full length of the arms from the sides, till such time as they are brought into contact above the head; the hands, then, turned outwards, should be allowed to fall slowly and steadily backwards, until the outer balls of the bells meet, as in the manner first described. This mode of using the dumb-bells being more difficult, from requiring greater muscular exertion, is better calculated for boys; yet, with slight modifications, it may also be advantageously had recourse to by girls, in whom there is any decided evidence of inclination of the spine to one side. When used in this manner, the weight of the bells should be from one-fourth to one-third less than when they are used in the way first recommended.

The exercise of the dumb-bells is found to be a most efficient means of calling into salutary action all the muscles of the trunk and upper extremities. The chest may be thus gradually and equally expanded; the shoulder



bones properly depressed and drawn towards the spine, and the symmetry of the back otherwise improved in a remarkable manner. At first, some difficulty and considerable bodily fatigue being experienced in using the dumb-bells according to the above rules, the exercise should not be persisted in longer than from one to two minutes at a time. After a lapse of eight or ten days,—the period at each successive trial being increased,—the exertion may be prolonged for ten or fifteen minutes, without being productive of any injurious fatigue.\*

This exercise should not be practised immediately after a meal; nor is it, perhaps, proper for children whose lungs are delicate, and who exhibit a tendency to consumption, because the organs devoted to breathing being, by such means, actively called into play, may be materially injured.† In schools, the exercise of the dumb-bells should always be properly taught, and conducted under the superintendence of the governess.

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\* When any obliquity of the spine already exists, experience has convinced me, that the utmost circumspection is requisite as regards the use of dumb-bells, otherwise more harm than benefit may result, from the child being incapable of regulating her movements so as to overcome the morbid bias imparted to the trunk by the curvature.

† The contrary is the popular opinion, and that indeed entertained by many professional persons.

A much safer, more elegant, and useful exercise is that performed with the wooden clubs, or sceptres, as they are now called, described at length in Donald Walker's little work on *Ladies' Exercises*.

Among exercises of beneficial tendency may be enumerated *Dod's Ball Exercise*, the nature of which and the mode of playing it may be gathered from the annexed wood-cuts.

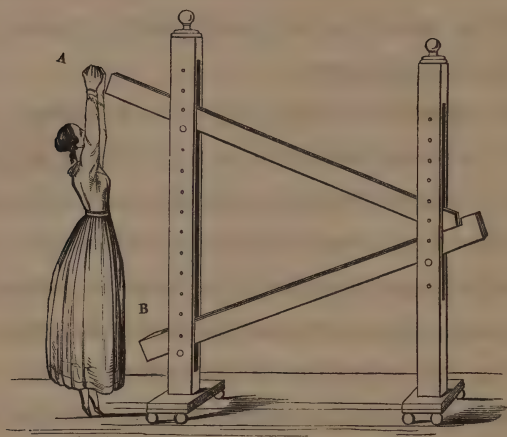


Fig. 1.

The apparatus here represented is a simplified modification of that suggested by the late Dr. Dod. The frame used by him was furnished with two unconnected shoots, so that the assistance of a second party was necessary to enable a young person to practise the exercise. In that here

recommended the shoots communicate with each other, and no such assistance is, in consequence, required.

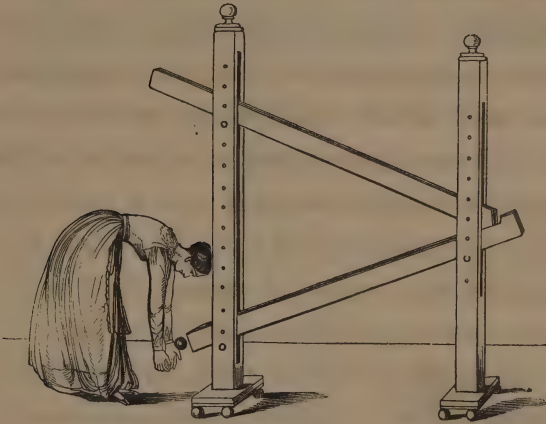


Fig. 2.

A ball dropped into the upper shoot, vide wood-cut, fig. 1, A,—which should be raised to the extent that the person to be exercised can reach when drawn up to her full extent and standing on tip-toe,—will roll through the shoot, and is to be caught at the lower extremity, B, which should be depressed to midway between the knees and ankles of the player. The young person, standing in the first drill position, should then stoop forwards in the manner represented in fig. 2, keeping her knee-joints straight, and arching the spinal column as perfectly and equally as possible throughout its entire

length. When caught, the ball is to be returned, as at first, to the upper shoot, allowed to run through, and to be again caught as before. The flexion and extension of the vertebral column may be repeated in this manner thirty, forty, or fifty times at each exercise. The contrivance of the frame and shoots enables the series of movements to be performed with a degree of regularity and precision attainable only with great difficulty, without determining, and having recourse to some such mechanical means of making fixed points of, the two extremes of flexion and extension.

*Some patients  
do this.*

Walking on a pole, or rope, elevated from ten to fifteen inches above the ground, and over which is supported a ladder, the cross-bars of which are placed at only a few inches distance from each other, affords an excellent means of stretching the spine by natural efforts, and of calling into action all the muscles of the body. The mode of exercising in this manner will be easily understood by a glance at the annexed wood-cut.

Balancing articles of a trifling weight, such as a work-basket, pincushion, a small bag of sand, or the like, upon the head; or a rod in each hand, alternately, form also simple and useful exercises.

These and similar pastimes,—for such they may be called,—being achievable only by a symmetrical

exertion of the muscles ranged on each side of the body, at the same time that they tend to strengthen



these organs, are calculated to correct, as well as to prevent, any deviation from a gracefully erect form.

Nor must we omit to notice the great advantages derivable from what have been denominated



passive exercises, more especially in cases where a tendency to deformity has already become manifest. Under the head of passive exercises may be enumerated friction of the surface of the body, with the hand, the hair glove,\* rollers, or the flesh brush; but more especially shampooing, thumbing, and the like.† In young persons of phlegmatic

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\* The hair-glove is open to objections. — It lacerates the cuticle, of which any one may be satisfied by examining the skin with a magnifying-glass after using it. The skin will be found to be much abraded, and the cuticle altogether deranged in the continuity of its surface. The natives of the East are sensibly alive to the importance of friction in promoting the offices of the skin; and to preserve its purity, its softness, and its polish, are in the habit of employing friction both at the bath and in the dressing-room. The means, however, employed by them, are of a much more gentle description than the horse-hair glove. They use a glove called the *kheesah*, made of the burruk or Persian glove cloth. Mr. Martin, formerly of the East India Company's Service, has introduced it into this country, and it is beautifully manufactured by Messrs. Savory and Moore of New Bond-street. It is alike applicable to a delicate or a coarse skin, and capable of effecting all the useful purposes of friction above alluded to.

† These, performed by a professional rubber, morning and evening, are often productive of incalculable benefit; though it need hardly be added, no credence should be given to the marvellous stories such manipulators are all disposed to relate of their own peculiar mode of *reducing the vertebrae*, in cases of deformity. In this respect they deceive themselves, from being ignorant of the manner in which rubbing proves beneficial; and it would have been unnecessary to allude to the circumstance

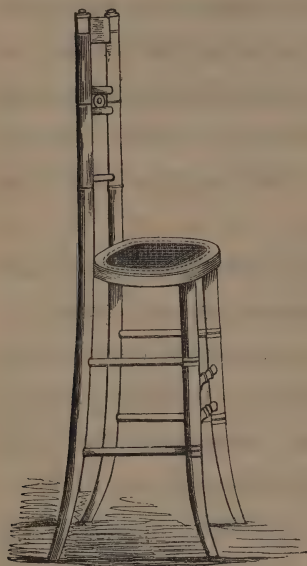
constitution, and whose circulation is languid, a current of electric sparks directed along the course of the spine daily, for the space of twenty minutes or half an hour ; or the warm douche-bath applied to the same region, for a similar length of time, often proves of great utility in imparting a healthy and vigorous circulation to the muscles so stimulated, thereby materially augmenting their power,

The muscles of the back, connected with the vertebral column, like those of other parts of the body, if retained in a state of contraction beyond the usual or habitual period, become exhausted and incapable of continuing the task imposed on them, or of readily obeying the dictates of the will, until such time as, during repose, they have received a new supply of nervous and vital energy. Any constrained posture, that keeps the muscles of the back and neck in a state of continued action, produces the sensation of failing or sinking, often urged by ladies as a plea for wearing corsets as a means of artificial support. Young ladies are enjoined to sit at all times upright, with a view to overcome, or prevent them

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at all, were it not that they often succeed in deceiving others also, and not unfrequently mislead both the patient and the friends, to the prejudice of the surgical attendant.

contracting, the habit of stooping. Now, there is no doubt, however proper it may be to correct awkwardness and indolence, that an indiscriminate



and rigid enforcement of this rule is very often the first cause of spinal curvature. To insist on a young person sitting perfectly upright at all times is quite unnecessary, and very injudicious. Neither is the objection removed by the employment of a perpendicular-backed education chair, such as that here delineated. The very nature of this chair, the

seat of which is too small, and the legs so long as not to allow the feet of the child to reach the ground, defeats its own object, and gives rise to fatiguing debilitating action of the muscles of the back and neck.

All muscles, when exhausted by exertion, require an interval of repose, in order that they may receive a new supply of irritability; and are during this time unfit for performing, with accuracy at least, their accustomed offices. If, then, a chair, such as that above delineated, be employed to

aid the fatigued girl, muscles, not adapted, except as occasional accessories, to keep the body in the erect position, are called into action, and cause the spine to deviate from its natural direction,—slightly at first, but finally to such an extent as to make it betray its want of symmetry, even to the most indifferent observer.

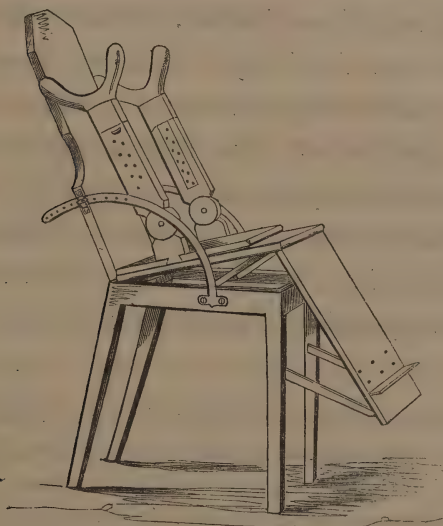
But these and equally valid objections to the use of the chair in question are usually met by the assurance that “Sir Astley Cooper approved of it,” and he is, indeed, generally quoted as its inventor. The authority of so eminent an individual is doubtless entitled to the highest consideration. We may venture to affirm, however, that Sir Astley did not sanction the employment of this chair for hours together, without allowing the child repose in a more easy attitude; yet this is a very common practice. Indeed, in many families, the daughters are not allowed to sit on any but chairs of this construction up to the age of fourteen years. The seat of the chair is always made unnecessarily and injuriously small, and placed at such a height as to deprive the body of the support which would be imparted to it, by the feet being allowed to rest upon the ground, or upon a moveable frame attached to its legs, at any convenient point. When an individual is sitting upright, his feet ought always to be supported. If the seat

of the chair, from being too narrow, only partially support the thighs, they drag, proportionately, the lower part of the body; the fatiguing influence of which is experienced more particularly in the loins. There is at the same time an unconscious muscular effort to draw up the legs, in order to prevent their weight from dragging the body off the seat, which, combined with the constraint produced in the upper part of the back, by the effort to maintain the erect position, tends to twist the spine, and becomes an additional cause of deformity. When the legs moreover hang down during a long continued sitting, and the thighs have not a sufficient support, the femoral bones are liable to become crooked, especially in rachitic children.

That discipline of this nature is extremely fatiguing and productive of great uneasiness, both in the loins and in the upper part of the back between the shoulders, is matter of experience, and of very just complaint with every young lady who has unfortunately been condemned to the empirical use of this education chair. A sitting posture, it should be remembered, does not necessarily relieve, or give rest to the muscles supporting the head and body. An unconstrained, easy, semi-recumbent, or perfectly supine, position can alone accomplish this desirable object. When-



ever, therefore, a delicate girl complains of being distressed or wearied by the erect position, she should be permitted to change it for a reclining, or such other easy posture as nature may dictate. An unrelenting enforcement of the upright position will, undoubtedly, defeat its own object, and expose its victim to the hazard of inveterate deformity. Young persons whose spines exhibit any tendency to feebleness ought to use a chair made with a reclining back, stuffed tolerably hard with horse-hair; the seat of which should form a double inclined plane, capable of being adapted to any angle, as here represented.



Without the precaution of raising the seat to

such an angle as to equal the reclination of the back, the body of the individual slides forwards by its own gravity, and renders the position not only uneasy but injurious. When the adjustment of the seat represented in the engraving is not required, the descending portion, if furnished with a proper hinge, may be so constructed as to double on, or under the ordinary seat of the chair. Whenever fatigued by the erect position, the child should be ordered to recline.\* When by such means rest has been obtained, the erect posture may be resumed. Similar alternations of exertion and rest may be made with advantage at intervals during the day, without disturbing a proper and judicious course of mental cultivation. It is by no means necessary that the body should be placed in a supine, or absolutely horizontal posture, as some of the abettors of the inclined plane system contend, for the purpose of relieving the spine of perpendicular weight. A very slight degree of reclination is sufficient for the purpose : of this any one may satisfy himself by a simple experi-

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\* It is quite a modern notion, that the act of resting during the day in a recumbent posture proceeds necessarily from indolence. We know that amongst the ancients a laterally inclined position was usually indulged in during meals, probably from some reason founded on a knowledge of its beneficial tendency in the development of the form.

ment. A piece of cord, or any extremely flexible body, that cannot, unaided, support its own perpendicular weight in the slightest degree, will remain perfectly straight, if laid against a card, piece of glass, or the like, that does not deviate more than five degrees from a right angle with the plane on which it stands. A reclining position, moreover, is not inappropriate for many of the more common purposes of life—reading, needlework, etc.—and neither fatigues the eyes so much in reading, nor presents so *outré* an appearance, as lying extended on the back. At all events, in cases of weak spine or slight curvature, it is quite adequate to fulfil every intention, and in many respects is infinitely preferable to any other position.\*

The inclined plane has of late years been very much employed for the purpose of preventing deformity, and is usually recommended by the medical profession as auxiliary to other means of cure. But, in regard to its employment as a part of school discipline, the principles on which it can prove serviceable are in general not understood, or not attended to. I have been at some pains to ascertain this fact, as well as the comparative result of its employment for the purpose of prevention; and am

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\* The back of the chair, if not stuffed as proposed, should be covered with rough baize, to prevent the person from slipping.

satisfied that, used as it generally is, no good whatever is derived from its employment. In fact, what is ordinarily considered to be the use, is an abuse of the means. The young ladies are accustomed to lie extended on a broad inclined board, for a definite length of time every day, generally immediately after breakfast, whether fatigued or not; in fact, before they have had an opportunity of becoming fatigued. During the succeeding part of the day they are subjected to the accustomed discipline of the school. Such a practice being a mere form, had recourse to when not required, is necessarily unattended by the slightest advantage.

Equally absurd and improper is it, in cases of lateral curvature, to insist on the patient retaining the horizontal posture for months, almost without intermission. When the plane is perseveringly employed, it proves a source of diminution of the muscular power, by preventing the young person taking the necessary bodily exercise; and when she afterwards arises from the horizontal posture, not only will it be found that the muscles and ligaments have lost their tone, but that the bones are by no means of so firm a texture\* as they ought to be;

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\* Allusion will hereafter be made to the influence of inactivity and long confinement in softening the bones.

and the deformity soon returns in a more aggravated manner.

Cases of ordinary lateral curvature are not to be treated in this manner. In rachitic deformity, as will be presently shewn, a sedulous observance of the horizontal posture may, in some cases, become indispensable, until the blood-vessels resume their healthy action, and deposit the necessary supply of earthy base for the consolidation of the bones.

When judiciously used as a preventive of deformity, the plane affords a convenient and systematic mode of relieving exhaustion of the muscles of the back and neck in delicate girls, without obliging them to obtain ease by throwing into contraction such as tend to produce an unseemly or injurious position,—an end which it accomplishes in a very complete and effectual manner. To have recourse to it, when rest is not required, is productive of little or no advantage.

In addition to the use of the reclining education chair, may be recommended that of short wooden crutches, padded and strapped round the body so as to pass between the axillæ and the seat. When accurately adapted, support, afforded in this manner, is less objectionable than that derived from a steel stay resting on the pelvis, as it throws the weight of the trunk on a base that is independent of the body; or, the crutches may be hinged to the chair,



as shewn in the wood-cut (p. 53), and used along with it when a reclining posture is desirable; they will thus admit of motion backwards and forwards, and allow the young person to semi-recline without impeding the movements necessary for ordinary purposes;\* or, the head may be supported by means of a spring collar, similar to that used by Mr. Chessher, attached to the top of the chair-back. But these extra aids are unnecessary, unless there exist, in addition to a feeble spine, some degree of curvature, in which case other means may be requisite, and a surgeon should be consulted. When only a slight

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\* Mr. James Wilson (*Lectures on the Physiology of the Skeleton*. London, 1820), in his observations on lateral curvature, admits the utility of instruments for supporting the weight of the spine, when they rest on parts that are independent of the patient's body, as on the chair; or, when they are suspended from the ceiling of the room; but entertains the singular notion, that if the patient be seated, these are improper. Thus he remarks:—"When seated, the chair may have an upright back, but no elbows or arms to it; for these would form a partial rest, which might prevent the muscles of the spine from being called into equal action,—and it is by this equal action that the cure is to be effected." The irrelevancy of this reasoning to the support afforded as here proposed,—and in accordance with the general principle, that the muscular system requires perfect repose, or that partial rest should be alternated with judicious exercise,—is too apparent to require comment.

deviation of the spine to one side exists, a belt may be passed over its convexity, and round the opposite crutch of the chair, and, if needful, an opposing support may be afforded, by passing a similar belt round the lumbar region, and lashing this portion of the spine to the opposite side. When this is done, it will be requisite to introduce an iron brace between the two crutches, in front of the chest, to prevent them from being drawn together. Each crutch will thus be enabled to afford a firm support, and a pad can be affixed at the top and bottom of each, if necessary. Should the patient be fifteen or sixteen years of age, it may be requisite to have the lower end of the crutches hollowed out, or somewhat curved, so as to fit over the pelvis, and bring their straight portion on a line with the axillæ.\*

When considered desirable, in consequence of incipient † yielding of the spine to one side, or of more

\* For the construction and mode of applying this contrivance, the reader is referred to the Engraving illustrative of the "*Treatment of Ordinary Lateral Curvature*," Chap. v, and there named the "Braced crutch support."

† It may be here observed, that it is very common to have recourse to the assistance of steel supports as soon as any tendency to curvature of the spine can be detected. The propriety of this practice, however, is very questionable, as in the majority of cases, during the early stages of the affection, judiciously selected exercises will arrest its progress, and, unaided, accomplish a cure.

marked curvature, that support should be continued whilst the young person is in exercise during the day, we are then obliged to make the pelvis the *point d'appui* of the crutches. A great variety of steel and other contrivances for this purpose are in use, of which delineations will be found in Chapters IV and V. Within a short period, Mr. Bigg, of Leicester-Square, has invented a very ingenious apparatus, which he calls "Orthospinalis"; of which also an account will be hereafter given. It has the merit of allowing all the necessary movements of the body to be performed with facility; while at the same time an extending power is applied between the pelvis and axillæ, and pressure is made upon the projecting portion of the deformity.

Other contrivances for the prevention of deformity are back-boards, back-braces, collars, and the suspended weight. On each of these it is necessary to offer a few remarks; and as the observations contained in Mr. Shaw's second series of *Illustrations*, embrace all that need be said in explanation of the erroneous principle on which the application of these ordinary means is in general founded, no apology for availing myself of these sentiments can be requisite.

"If the shoulders be braced by means of straps to a plate of iron placed on the back, it is evident that the action of the muscles, with which nature

has endowed the body for the express purpose of holding the shoulders in a graceful position, will be superseded; and in accordance with the general law before enlarged upon, will, from want of due use, become proportionably incapable of performing their wonted office when the strap is removed. The muscles on the fore part of the chest, whose actions are destined to be an equalizing and antagonist power, will, from being excited to resist the force exerted by the straps, become increased in strength. When the use of the straps is discontinued, the shoulders will not only return to the position which they held previously to the application of the plate, but be further drawn forwards by the power gained by the muscles on the fore part of the chest, while opposing the action of the straps. No constraining force then should be employed with a view to keep the shoulders back. Machines of every description for the prevention of deformity, or for the cure of bad habits, should, if possible, be avoided: they are at best very inefficient substitutes for the means provided by nature." In young persons, in whom we may wish to correct round shoulders, or a habit of stooping, we can obtain our object, and at the same time improve the general health and strength, more by a superintendence of their exercises and amusements, so as to make a mode-

rate demand for muscular exertion on particular parts of the body, than by the use of back-boards, collars, or any kind of mechanical contrivance. The dumb-bells, used in the manner described in p.40 et seq.; the Spanish exercise,—one of the most beautiful of the calisthenic; and, indeed, many of the more ordinary games at which young ladies are accustomed to amuse themselves, while they serve as healthful recreations, might be easily converted into valuable special exercises by a few judicious suggestions on the part of a superintendent acquainted with the physiology of muscular motion. Exercises of this kind would have the advantage of being more interesting than the automatic movements of the drill-master, or those, almost equally formal in their nature, of the teacher of calisthenics.

It is scarcely necessary to enumerate games that might be converted into special exercises. *La grace, le diable boiteux*,\* skipping, the use of the ordinary hoop, archery, battledore, and the like, will at once suggest themselves. The latter game, indeed, may be rendered highly subservient to improving the carriage if played double-handed, as represented in the wood-cut subjoined.

The shuttlecock is to be struck with the right

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\* *Anglice* “devil on two sticks.”



and left hand alternately, in such a manner that, on each occasion of falling, it would drop somewhat behind the player if not again struck with the battledore.

When the body is thrown into the position represented in the wood-cut, and the game is played in the manner just described, the spinal column is kept



fully stretched by the natural action of the muscles inserted into its length; while the inter-scapular and articular muscles of the shoulder joint are exercised in the way best calculated to rectify a stoop forwards,—the cause of “high shoulders”,—and to improve the form of the trunk generally.

Another mode of correcting the habit of stooping, by a similar process of muscular exertion, is to direct the young person, when walking about the room, to balance upon her head some light soft object, such as a bag of sand, or a pincushion, the weight of which is equal to four or six ounces. The efforts made to maintain the erect posture,

necessary to prevent the balanced object from falling off her head, if not too long continued, strengthen the muscles at the back part of the neck, and in course of time the upright position becomes that habitually adopted without conscious muscular effort. Or, the same end may be accomplished by carrying a weight suspended in front of the body, by passing a strap round the back of the neck. Thus we observe that pedlars, and other persons, who carry their wares in a box or basket in front of the body, are generally very upright and broad-chested; but that those, who are accustomed to carry burdens on the back, which are in part supported by means of a band passed round the forehead,—as porters, and the fish-women of Scotland,—are round-shouldered, narrow-chested, and often very much bent forwards.

The advantages that may be derived from carrying a light weight on the head, for the purpose of rectifying a feeble condition of the spine and incipient curvature, were first insisted on by Mr. Grant, of Bath, whose practice was afterwards very warmly advocated by the late Mr. Wilson, to whose lectures allusion has already been made.

Mr. Wilson assures us that the event of this practice often, in the short space of three weeks, exceeded his most sanguine expectations of success; and that, in no instance, where the exercise was pro-

perly persevered in, had he found it to fail in preventing the further progress of the disease; while in many it had effected a perfect cure; at least, so perfect, that no deformity was perceived, nor inconvenience in other respects suffered. Mr. Wilson, however, much overrated both the advantages and the rapidity with which the exercise can prove beneficial.

A weight carried on the head has always appeared to me a better mode of causing the patient to straighten the vertebral column by natural efforts, than when suspended in front of the body: though each plan may be practised alternately by way of changing the exercise.

There are, moreover, certain practices, not yet mentioned, calculated to prove injurious to the symmetry of the spine. Some of these refer to a much earlier period of life than that which we have been hitherto considering: others do not apply to any particular age. The habit which nurses are apt to acquire, of always carrying the child upon the same arm, may give rise to deformity; as the side of the child which is at liberty, being thus more exercised than the other, may attain a degree of development destructive of the natural equilibrium of the physical powers on each side of the body. This habit is also liable to prove detrimental to the nurse, who may herself become "side bent,"

or crooked, at the same time that her charge is suffering in the back and limbs. "English nursing," says the author of the *Art of Beauty*, "in the sense in which it is usually understood, may be rightly interpreted, the art of deforming and weakening children by ill-directed care." Now, although we do not go so far in our invective as to admit this definition in its fullest extent, yet it merits notice. Nothing, for example, is more improper than to compel an infant only a few weeks' old to sit in an upright position for one moment, without the most perfect support being given to every part of the trunk, and more especially to the spine. The head totters and shakes, like that of a palsied person, in consequence of the feebleness and instability of its support, and the spine bends in every possible direction. Yet it is by no means uncommon for nurses, who pride themselves, perhaps, on their practical knowledge, to carry an infant in this unnatural and injurious position before it is even a month old; and thus ignorantly,—we can hardly add innocently,—for when told of their error it is seldom that their self-importance will yield to correction, in numerous instances, lay the foundation of deformity. The rule of increasing strength by exercise is good in principle, but it must be understood within certain limitations; else it may be readily abused. It is



not till after a lapse of many weeks that the spine is able of itself to support the head and other parts attached to it, and at the same time to retain the erect posture.

“Never prevent a child,” says a late writer,\* “from attempting to walk, however young it may be.” But in this respect, does not the author carry his zeal for the encouragement of exercise to an untenable excess? It is unnecessary to record examples of deformity, both of the back and limbs, produced in rachitic children by this practice. They must be familiar to every one.

Children who sleep two in a bed, contract a habit of always lying on the same side of the body, calculated, in the predisposed, to favour the production of crooked spine. When the pillow is very high, and the bed soft, as is the case in feather and down beds, the attitude into which the body falls is very hurtful to the shape. The loins sink into the bed, the back becomes twisted, and the neck turned awry. A girl who contracts a habit of lying in this mal-position, for years together, every night, (as is sometimes the case), can scarcely fail to have her figure injured. Instead of a soft bed, a hair mattress should be used, with rather a low pillow; and when children sleep together, they

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\* Dr. Davis's *Oracle of Health*.



should be directed to change sides every night. Similar bad consequences result from sitting much in one posture—a habit which persons are apt to fall into who sit always on the same side of the fire, or in the same direction with respect to the light. They are thus induced to lean to one side, and to retain the body in that position, until nature, by moulding the bones into new forms, renders them unable to recover their natural condition.

From a knowledge of this fact, we are led to disapprove the custom, common in many schools, of assigning to each scholar a seat in a particular part of the school-room. The seats should be common to all, and occupied by all in succession. To the practice also of compelling the class to stand, while the children are repeating the lessons of the day, may often be traced pernicious results. Boys, when obliged to stand during a length of time for this purpose, are very apt to relieve the muscles that maintain the body erect, by balancing themselves on one leg, generally on the left.\*

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\* In order more effectually to prevent young ladies from leaning, or standing crooked, by balancing the body on one leg, it is not unusual in schools to make each one in the class, while repeating the lesson, hold a book or small weight on the head. Though suggested as an exercise in a former part of these remarks, it may be here requisite to observe, that balancing a weight upon the head should never be resorted to while the attention is

Girls, from the confinement occasioned by their dress, being often prevented from bending the body, so as to balance it on one leg sufficiently to afford relief, attempt to preserve their equilibrium by passing the left hand round the back, and drawing down the right elbow. Although it is undoubtedly proper that a girl should be suffered to vary her position at will when fatigued, yet, as formerly observed, she should not be permitted to habituate herself to indulgence in any injurious or ungraceful attitude. To avoid the consequences we have been enumerating, the class should sit while repeating the lesson. The body, whilst in motion, can be maintained erect for hours at a time, without the person experiencing inconvenience. To stand upright and motionless, even for the space of five minutes, is extremely wearisome.

The previous details of the various exercises and pastimes, may probably be more minute than is necessary for the greater part of my readers; but I have considered it essential to give them, because I am aware that many, who have not had much experience in the treatment of deformities, are often at a loss what exercises to suggest; and

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otherwise occupied, nor persisted in after the body is fatigued by standing. It is therefore improper whilst the attention is occupied in repeating a lesson.

instead of recommending simple ones, or amusing pastimes, attainable by every one, especially in the country, they frequently recommend a course of calisthenic exercises, often unattainable, and always expensive: as, to be of use, these exercises must necessarily be persevered in for a great length of time.

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## CHAPTER II.

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OPINIONS OF VARIOUS AUTHORS RESPECTING DISTORTIONS  
OF THE SPINE.

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MR. POTT, ON ANGULAR CURVATURE—MR. BAYNTON'S SYSTEM OF REST—MR. CHESSHER, OF HINCKLEY, ON EXERCISE UNDER MECHANICAL SUPPORT—DR. EDWARD HARRISON'S MECHANICAL EXTENSION AND KNEADING—MR. JOHN SHAW'S OPINIONS ON THE TREATMENT OF LATERAL CURVATURE—MR. WILLIAM TILLEARD WARD, ON THE SAME—MR. COPELAND'S OBSERVATIONS ON THE INCIPIENT SYMPTOMS OF DISEASED SPINE—WORKS OF SIR JAMES EARLE, MR. ABERNETHY, SIR B. C. BRODIE, BART., MR. WILSON, MR. LLOYD, MR. W. R. BAMPFIELD, MR. STAFFORD, MR. SHELDRAKE, MR. BEALE, MR. COULSON, MR. TUSON, MR. LONSDALE—MONS. GUERIN'S PROPOSAL TO DIVIDE THE SPINAL MUSCLES.

BEFORE considering, in a more especial manner, the various kinds of deformity to which the vertebral column is liable, and the means to be adopted for their removal or relief, it may be useful to make a few observations upon some of the principal opinions entertained respecting these affections in general, and the several methods of treatment, which have been successively proposed by surgeons in this country.

It is only of comparatively recent date that professional men have turned especial attention to the

subject of deformities. Previous to the time of Mr. Pott, very little was known of the pathology of these affections: for practical purposes, therefore, it is unnecessary to trace the proposed outline further back than the period when that surgeon first pointed out the true nature of one kind of spinal curvature—that now known by the name of “*angular projection*”; and for which he suggested a plan of treatment that has been extensively employed ever since its introduction. Mr. Pott shewed that distortion of the vertebral column, assuming the form of which the name is so descriptive, usually arose from carious destruction of the bones; and was, to a certain extent, irremediable; although the disease whence it proceeded might, in many instances, be arrested by the use of counter-irritation, and the establishment of a local drain, near the seat of ulceration. For this purpose he recommended the employment of caustic issues, made with the *potassa fusa*; perfect rest in the horizontal posture, and suitable constitutional management. It does not, however, appear from Mr. Pott’s writings, that he was aware of the various pathological changes which give rise to destruction of the vertebræ. Morbid appearances had not been sufficiently observed and discriminated in his day: hence, he knew not why in some cases his treatment proved successful,



while in others, of apparently less severity, it failed. Neither does he seem to have been aware of the fact that, in certain instances of *tubercular* disorganization of the vertebræ, the matter generated by the ulcerated surface is not so liable, as in other destructive diseases of these bones, to work its way to the surface, but may remain pent up in the body of the bone, or in a sac formed by the thickened vertebral ligaments, and be removed, in process of time, by absorption, whether issues be applied or not; new bone being deposited, so as to fill up, in an imperfect manner, the hiatus caused by the ravages of the primary disease; a spontaneous cure by ankylosis being thus finally effected.\* He therefore, probably, as others have done since, attributed many cures to the mode of treatment he had pursued, which would have occurred equally had no counter-irritation been applied. Mr. Pott has also left the diagnosis of certain severe cases of deformity, (generally supposed to be of rachitic origin), closely resembling the angular curvature in their physical characters, so imperfect, that there is reason to believe many cases of this nature

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\* The power of nature in effecting restoration in some cases of diseased spine, as far as the reunion of parts is concerned, is very considerable. Instances are known in which curvature of nearly the whole of the dorsal vertebræ has followed upon caries, and in which ankylosis has been perfect, and the health of the individual left almost unimpaired by such a condition.

were mistaken, and treated as ulcerative disease of the bones. Nay, deformities of a far less important kind, that require a very opposite mode of management, were then, and are often at the present day, misunderstood, and submitted to Mr. Pott's discipline. The blunder is not detected, no ulceration takes place, indeed it is a question whether any ever threatens; after a time the issues are removed, the patients are allowed to move about again, and the cases are considered cures. I mention these circumstances, not with a view of detracting from Mr. Pott's merit, or of depreciating the value of his mode of treatment, when had recourse to in properly selected cases; but merely for the purpose of drawing attention to facts which have tended to swell the list of cures, and magnify the advantages of Mr. Pott's system, and thus to mislead those who might otherwise have recourse to it in proper cases only.

During the period in which Mr. Pott acquired his well-earned celebrity for the history, pathology, and treatment, of deformities arising from caries of the vertebræ,\* other curvatures of the spine were comparatively little attended to. Those surgeons

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\* *Remarks on the Palsy of the Lower Limbs.* London, 1779. 8vo. *Further Remarks on the Useless State of the Lower Limbs, in consequence of a Curvature of the Spine.* London, 1782. 8vo.

who could distinguish between them thought none worthy of attention but that described by Mr. Pott; and those who could not make the distinction treated all such cases as were forced upon them, in consequence of their severity, in an empirical manner. That errors of this description are even now daily committed by practitioners, whose professional acumen in other respects is in no manner deficient, is matter of frequent observation to those whose attention has been especially directed to the study of this important division of surgery. At the period alluded to, the nature of ordinary *lateral* curvature was not understood, and the management of this affection became, in consequence, the province of persons unconnected with the profession, or of a few surgeons only, who saw their advantage in attending to the subject.

Mr. Baynton, of Bristol, was the first in this country who undertook the cure of this, as well as the other kinds of spinal distortion, in general, on scientific principles; but the plan he pursued, has, since his day, been found not only inefficient, but to be based on an erroneous theory of the nature and causes of these affections. Mr. Baynton maintained\* that the *vertebræ were soft-*

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\* *An Account of a Successful Method of Treating Diseases of the Spine; with Observations and Cases in Illustration.* London, 1813. 8vo.

*ened*,\* and his object was to restore them to their proper hardness. The plan he pursued for this purpose consisted in confining his patient constantly to the recumbent horizontal posture. The patient was ordered to lie on his back for weeks, months, nay years, without being allowed to rise from that position upon any *occasion whatever*. It was presumed, that by keeping the spine constantly in an unobjectionable posture, calculated to remove the superincumbent weight, the bones would acquire strength and firmness, and the symmetry of the back be eventually restored. The error of this theory will become apparent hereafter, when it is shewn how essential exercise is to excite that degree of vigorous and healthy circulation in the bones, on which their due solidification mainly depends. Accordingly, it was found that whatever degree of apparent benefit had arisen from the long observance of the supine posture, the discipline was calculated to render the bones really soft, had they been hard before, and at the same time to enfeeble the muscular and ligamentous system, as well as the general health. Patients so treated often became much worse after they resumed their usual occupations than they were

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\* This is true only in certain cases, as will be explained in Chaps. iv and v.



before they submitted to such a system of rest and inactivity.

The plan of Baynton being found inadequate to the permanent rectification of curved spine; and Mr. Pott's method having been discovered to be proper in the treatment of distortions proceeding from caries of the vertebræ only; Mr. Chessher, of Hinckley, introduced a new method of cure, which, like Baynton's, was employed in all cases, though considered more especially suited to such as were unconnected with disease in the bones. Having arrived at a knowledge of the fact that exercise in the open air was very essential to a successful treatment of these affections, his plan consisted in relieving the spine of the weight of the head and upper extremities, by means of steel crutches, or rather of a steel frame-work, that rested on the pelvis, from which arose supports of the same metal, extending between the axillæ and ilia, and a spinal upright behind, to which was affixed a head-piece and chin-collar. He thus succeeded in extending, in some degree, the spinal column, and at the same time in relieving it of all weight, while his patient was enabled to take exercise and keep the general health in good order. The main objections to this plan were the serious inconvenience the patients experienced in wearing the apparatus, in consequence of its chafing all the parts pressed upon,



and the still more important one of not effecting any permanent good. The patients, it is true, were not deprived of exercise ; but the muscles of the back and trunk in general,—those in reality which especially required it,—got none ; and although the spine might be kept in a state of extension, calculated to pull it straight, yet it was denied the rectifying influence of nature's own means for this purpose.

Since Mr. Chessher's time, various spinal instruments have been introduced, and, as now used, they all individually possess certain merits ; but to none of them must we trust alone for the rectification of deformity. They are only useful as a means of affording support during the period that more active curative treatment is being resorted to. The orthospinalis, lately invented by Mr. Bigg, of Leicester-Square, possesses, however, other advantages, and is, perhaps, the most perfect contrivance of any. In addition to affording the necessary support, this apparatus allows the spine to be bent in any direction, so that the patient may take the requisite exercise, while an extending power, produced by an ingenious adaptation of springs, is always in operation. A more particular description of this instrument will be given in Chap. v.

The next plan that may be noticed was that of

the late Dr. Edward Harrison,\* who, to the system of Baynton, added mechanical extension by means of a windlass, so as to straighten, and, as he imagined, enable him, by kneading and hammering, to reduce the projecting, or irregular vertebræ, which he erroneously maintained were placed in relation to each other, in a manner similar to that which obtains in semi-luxation. Instruments exercising a power of extension upon the spinal column, when the bony structure is in any degree diseased, cannot but be productive of great mischief, and must effectually impede the curative effects of nature; yet, Dr. Harrison has still his imitators and admirers, though happily they are but few in number. Whatever benefit may have been achieved by Dr. Harrison, is to be attributed to the confinement of the patient in a horizontal position, and the adoption of certain manipulations, such as friction, shampooing, kneading, etc., by which the tendency of the muscles to a loss of tone from want of exercise was counteracted.† The extent to which

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\* *Pathological and Practical Observations on Spinal Diseases.* London, 1831. 8vo.

† Passive exercises of this description are known to be highly useful in cases of spinal deformity, unconnected with disease of the vertebræ; on the other hand, when caries exists, they can prove of no service. In the early stages of ankylosis, such a practice is calculated to do much harm, by jarring the spine and

he carried his notions of the dislocation of the vertebræ, in cases of spinal distortion,\* are scarcely worthy of notice. It cannot be denied that the ligaments, by becoming diseased, may lose their power of maintaining and confining the bones in the situation necessary for the due performance of the varied motions which they are destined to execute; but this is a condition widely different from that of a luxation, and the consequences are also dissimilar. Dr. Harrison, however, was not satisfied even with pronouncing this condition to be existent; but added, also, that the texture of the bones became so soft that they admitted of being "moulded like wax."†

The surgeons who first satisfactorily pointed out the nature and causes of ordinary curvatures, unconnected with any morbid condition of the vertebræ, were the late Mr. John Shaw, and Mr. William Tilleard Ward; and it must also be added that these gentlemen at the same time indicated the most appropriate system of treatment, which is still generally pursued, though carried out in a variety of ways, by different practitioners. Mr.

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interfering with the process of solidification, at a moment when a bony reparation of the destroyed parts might otherwise be effected.

\* See pages 38, 52.

† Page 18.

Shaw's work\* is confined to the consideration of lateral curvature; and it is much to be regretted that his life was not prolonged to admit of the publication of his opinions on other kinds of spinal deformity: sound physiological knowledge distinguished his inquiries.

The theory put forth by Mr. Shaw may perhaps be fairly stated in this manner:—The predisposing cause of certain kinds of spinal deformity is incapacity in the musculo-ligamentous apparatus to perform its appropriate functions; and the exciting agent is constrained position long continued or so frequently repeated as to give rise to partial absorption of the compressed vertebræ, so that they become misshapen and wedge-formed. No part of the body, he conceived, offers to our notice more strikingly the consequences arising from want of exercise of its muscles than the structures which form, or are connected with the vertebral column. Muscular weakness was regarded by him as one of the most frequent causes of lateral curvature, and as generally preceding and accompanying the invasion of this kind of deformity. The ancients were well acquainted

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\* *On the Nature and Treatment of the Distortions to which the Spine and the Bones of the Chest are subject.* London, 1823. 8vo. *Further Observations,*—ib. 1825. 8vo. Engravings illustrative of the same. London, 1824. Folio.

with the importance of gymnastic exercises to maintain the healthiness of the system and the proper evolution of its several parts. In fact they, by observation, remarked that which, with the advance of science, has been ascertained to be one of the most important laws of the animal economy, "that the exercise of an organ is necessary, not only to its perfection, but even to its preservation"; the want of it, then, must tend to effect disproportional development and consequent deformity. Under this view it was that Mr. Shaw conceived the most probable source of distortions was to be found in "the cessation of the actions of some particular part, or in the undue and partial exercise of others.\*

Mr. Ward, on the contrary, appeared to consider hypertrophy of the muscles on the concave side of the curvature, as the principal cause of these affections.† Both theories are correct in certain cases, but that of Mr. Shaw applies far more generally. The treatment suggested by these surgeons consisted of judiciously selected exercises, alternated with rest in a recumbent posture; or in giving support, so as to remove the

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\* Page 19.

† *Practical Observations on Distortions of the Spine, Chest, and Limbs.* London, 1840. 8vo.



weight of the upper extremities and trunk when not in this posture.

In 1815, Mr. Copeland published "*Observations on the Symptoms and Treatment of the Diseased Spine.*" The observations of this highly respected and talented surgeon are condensed into the form of a short, but useful essay, which may be regarded as a practical commentary on the general history of caries of the vertebræ that was previously published by Mr. Pott. Mr. Copeland's remarks are chiefly directed to the *early* diagnostic symptoms of this condition of the bones, a most important subject of inquiry, but one which Mr. Pott had left incomplete in his work. Mr. Copeland conceives, in all cases of incipient caries, and consequently of angular distortion dependent on ulceration of the vertebræ, that, long previous to the establishment of destruction of the osseous texture, the intervertebral substance and thecal linings of the medullary canal become so thickened and swollen from inflammation and infiltration, as to occasion pressure on the spinal marrow, sufficiently marked by symptoms of slight paralysis of the abdominal or other muscles to be always discoverable, if carefully sought for. The same phenomena were most accurately described by Mr. Pott, but not regarded in precisely the same diagnostic point of view as they are by his commentator.

In the year 1836, Dr. Louis Stromeyer, of Hanover, introduced a novel theory of lateral curvature, in a short treatise entitled "*Ueber Paralyse der Inspirations-muskeln.*" After much minute investigation of the mechanism of inspiration, Dr. Stromeyer was led to conclude that the ordinary form of lateral curvature is produced by paralysis of the respiratory nerves of the external muscles of inspiration. His theory is supported by much ingenious reasoning; and although we may not be disposed to admit Dr. Stromeyer's views in their full extent, nor determine how far they may be applicable in the treatment of the curvature in question, still, no one who studies them will deny, that they possess great originality and merit. When the respiratory muscles are paralysed on one half of the trunk, the dilatation of the chest on that side during inspiration will be more or less imperfect; while, perhaps, to counterbalance this deficiency of so essential a function as that of respiration, the sound side may, by insensible degrees, become habituated to abnormal dilatation. The loss of the equilibrium of the trunk, and the disparity in the development of its two halves, thus occasioned, would, it is clear, operate as a powerful source of spinal curvature. But admitting the fact that paralysis of the respiratory nerves, more or less complete, does occa-

sionally happen on one side of the body, we cannot admit that it proves so common a cause of deformity as Dr. Stromeyer is disposed to believe. The sources of such a condition of the nerves as is alluded to, are by no means evident; and the ætiology which the Doctor himself advances, is altogether unsatisfactory and hypothetical.\* The treatment proposed, in accordance with this theory, does not materially differ from that usually pursued; but the rationale offered of its *modus operandi* is made subservient to the Doctor's peculiar views. Thus, he considers that gymnastic training proves useful by "imparting tone in an especial manner to the muscles of respiration." He suggests the use of a sort of hammock, in which the patient is to lie in a lateral position on the convex side of the curve, in such a manner that the superior part of the chest is elevated, and "its expiratory muscles brought into full activity"; a position, which, he informs us, MM. Pravaz and Guerin, despite their false reasoning concerning

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\* The late Mr. Shaw, many years before Dr. Stromeyer's treatise appeared, pointed out, in his *Observations on Deformity connected with Infantile Paralysis*, that there was reason to believe that the respiratory nerves are occasionally implicated, and that the unequal play of the costal parietes proceeding from this source is often a main cause of inclination of the spine to one side.

the causes of curvature, had been led by practical observation to adopt; this position has, within a recent period, also been the subject of a useful practical essay by Mr. Lonsdale, whose couch for the purpose of lateral pressure is perhaps an improvement upon that of Dr. Stromeyer. How far the lateral position is applicable in cases of long standing, in which there exists a double curvature and considerable rotation of the vertebral column, the usual concomitant of the advanced stages of the affection, remains to be proved.

Other practitioners of eminence have become favourably known to the public as having devoted their attention to this inquiry since the period at which this outline commences, but the doctrines they have advanced, as well as the treatment they have recommended, all partake, more or less, of those systems already described. Nothing more is necessary, therefore, in the present place, than to mention the names of Sir James Earle,\* Mr. Abernethy,† Sir Benjamin C. Brodie, Bart.,‡

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\* *Observations on the Cure of the Curved Spine.* London, 1799. 8vo.

† *Surgical Works.* London, 1811. Two vols. 8vo. Second Edition. 1827.

‡ *Pathological and Surgical Observations on Diseases of the Joints.* London, 1818. 8vo. Fourth Edition, 1845. And *Lectures in Medical Gazette.*

Mr. Wilson,\* Mr. Lloyd,† Mr Bampffield,‡ Mr. Stafford,§ Mr. Sheldrake,|| Mr. Beale,¶ Mr. Coulson,\*\* Mr. Tuson,†† Mr. Lonsdale,‡‡ etc. The opinions of these writers will be referred to in the course of the ensuing chapters. It will, therefore, only be necessary here to notice, in a few words, a system, not many years since proposed by M. Guerin, of Paris, in which he ventured to recommend the making a division of certain of the spinal muscles as auxiliary to the cure of lateral curvatures of the spine. The muscles proposed to be divided were the trapezius, the rhomboideus, the angularis

\* *Lectures on the Structure and Physiology of the parts composing the Skeleton, and on the Diseases of the Bones and Joints, etc.* London, 1820. 8vo.

† *Treatise on the Nature and Treatment of Scrofula.* London, 1821. 8vo.

‡ *An Essay on Curvatures and Diseases of the Spine.* London, 1824. 8vo.

§ *On the Nature and Treatment of the Diseases, Distortions, and Injuries of the Spine.* London, 1839. 8vo.

|| *Essay on the Cure of the Distorted Spine.* London, 1810. 8vo.

¶ *Observations on Distortions of the Spine and Limbs.* London, 1833. 8vo.

\*\* *On Deformities of the Chest and Spine.* London, 1837. 8vo. Second Edition.

†† *The Cause and Treatment of Curvature of the Spine.* London, 1841. 8vo.

‡‡ *Observations on the Treatment of Lateral Curvature of the Spine.* London, 1847. 8vo.



scapulæ, the sacro-lumbalis, the dorsalis longus, and the transversalis dorsi ; and he published several cases in which, according to his statements, such treatment had been successfully employed. The practice was taken up by several competent surgeons in this country, and submitted to a fair trial. At first it was thought that great benefit might be derived from it ; but, I believe that, ultimately, a careful examination of the results proved it to be inadequate to the effects proposed. The operation of M. Guerin is, therefore, now scarcely ever had recourse to, unless (as will be seen in a future chapter) subject to great limitations ; or confined to the division of the aponeurosis of the sacro-lumbalis. Lateral curvatures do not depend upon permanent muscular contractions independently of other morbid conditions of the spinal apparatus in general, and therefore cannot be so much benefited by the myotomic operation, as on a cursory examination of the subject we are apt to imagine.

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## CHAPTER III.

## DIVISION OF THE SUBJECT.

SPINAL DEVIATIONS AS A DISTINCT CLASS OF DEFORMITIES —  
THREE DIVISIONS OR ORDERS PROPOSED : 1. ADVENTITIOUS  
CURVATURES ; 2. RACHITIC CURVATURES ; 3. SCROFULOUS  
CURVATURES—THEIR VARIETIES—INFLUENCE OF HYSTERIA IN  
PRODUCING DEFORMITY.

THE several deviations of the vertebral column from its natural and healthy direction, considered collectively, may be regarded as constituting a distinct *class* of deformities. The diagnostic peculiarities which these present, viewed pathologically, offer, perhaps, the least objectionable, and at the same time the most practically useful basis for the division of the class into *orders* ; and the visible differences of external character, which deformities may assume, being all distinct and easily recognizable, afford a very convenient ground for further division of the orders into particular kinds. In accordance then with this plan of arrangement, it is proposed in the following inquiry to consider :

1. Curvatures not essentially connected with any cognizable morbid change in the vertebral column beyond that of *form*.

2. Deformities dependent on previous or concomitant softening of the vertebræ and ribs, proceeding from *rachitic* or other general causes.

3. Distortions arising from *scrofulous* degeneration, and subsequent ulcerative destruction of the vertebræ and adjacent textures.

These three orders of spinal deformity, as well as the varieties of physical character they may severally assume, are liable to intermixture; their extremes, indeed, pass by such insensible gradations into each other, that it is often difficult, sometimes impossible, to determine, during the life of the patient, the precise nature of the pathological changes which a *post mortem* examination may disclose. For the purpose of description, however, and as affording a guide to appropriate surgical treatment in cases unattended by the difficulties alluded to, this mode of dividing the subject will probably be found to be as free from objection as any other; neither will it present greater obstacles than are usually experienced in attempting to reduce to systematic arrangement any other class of diseases.

To the *first order*, which, as already defined, embraces all cases of spinal deformity not essen-

tially connected with any cognizable morbid change in the structure or other qualities of the column beyond that of its *form*, it is proposed to apply the term *adventitious*,\*—such deflections of the spine being always produced by the operation of exciting causes, more or less accidental or adventitious in their nature.

To the *second order* the term *rachitic* may be applied, although it will include all cases in which any softening of the bones is produced, analogous to that which indicates the rachitic diathesis. Thus, the influence of mercury; the debilitating effects of hemorrhage; continued and profuse natural discharges; the constitutional sequelæ of certain acute febrile diseases, such as small-pox, scarlatina, measles, and the like; protracted and close application to study before the mental powers are sufficiently developed; or long continued manual labour, as in factories, especially when aided by confinement in ill-ventilated apartments; privations of diet, and want of proper exercise; are

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\* The term *adventitious*, I am aware, might with equal propriety be applied to curvature of the spine arising from other sources; but in the following pages, I propose to limit it to such cases as are unconnected with any change in the relative proportion of the chemical constituents of the vertebrae, with caries, or with any other morbid condition of the structure of these bones.

all agents prone to induce a state of bones, extremely similar to that which characterizes true rickets, in persons of strumous habit and otherwise primitively feeble powers, about the age of thirteen or fourteen years, when nature is struggling to establish the changes in the system essential to puberty.

To the *third order*, the *scrofulous*, belong all cases of spinal curvature, in which the vertebræ suffer either any actual degeneration of texture, or the substitution of a new product for that of healthy osseous deposit. The pathological characters of these changes may be of various kinds, —adipoceroid, tubercular, scirrhus, fungoid, or the like; but in one respect they all agree, viz., in a tendency to terminate in ulcerative destruction of the parts affected; and in this manner to become the proximate cause of deformity.

The modifications of *physical* character presented by these several orders, afford the basis of a simple and practically useful nomenclature, easily remembered, and equally applicable to them all.

The inclination of the column, for example, may be to one or other side of the body; or there may exist a double curvature in the course of the spine to each side alternately. Thus we have *lateral* curvature, *dextro*, *sinistro*, and *ambi-*



*lateral* curvature ; and when a third inflection is present, the column is said to be *serpentine* in its direction, as represented in the subjoined woodcuts.



Fig. 1.



Fig. 2.

The convexity of the faulty portion of the column may be directed forwards. The flexure is then called *incurvation* ; or, it may point in the opposite direction, when it is named *excurvation*. We have also the terms *cervical*, *dorsal*, and *cervico-dorsal* ; *lumbar*, and *dorso-lumbar* curva-

tures, referring to the various portions of the spine in which the deformity may occur.

To express the appearance presented by the ordinary examples of deformity produced by scrofulous ulceration, as well as to indicate the degree of curvature usual in these cases, the terms *angular projection*, *conic protuberance* and *gibbous spine*, have been employed by authors. The annexed

engraving exemplifies this description of distortion.



In separating the deformities caused by rachitis and scrofula, and constituting each a distinct and separate order, it is not to be inferred that the two diatheses are considered to differ from each other in any essential degree. On the contrary, there can be little doubt of their identity; to the extent, at least,

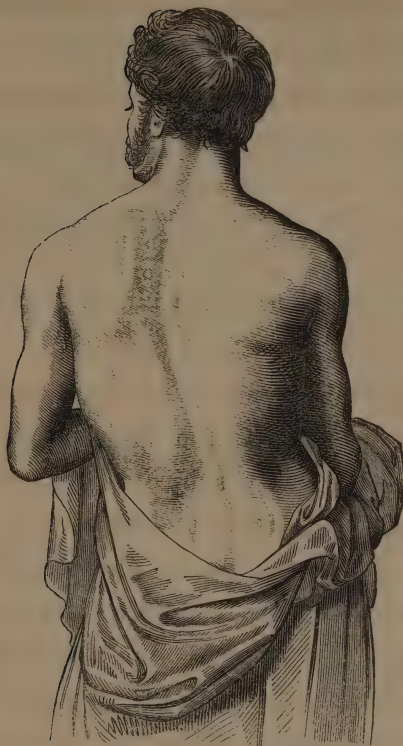
of admitting rickets to be one of the forms which scrofula may assume. Yet, as it would appear that certain laws giving rise to pathological changes, sufficiently distinct and characteristic to warrant the separation as regards the spine, are very generally observed in the rachitic manifesta-

tion of scrofula, no inconvenience can spring from this subdivision, provided a definite limit be assigned to each order. The limit here proposed restricts the term rachitic to curvatures depending on simple softening of the vertebræ, from want of due proportion between their chemical constituents. Whenever any other change of structure commences, the case should be considered as referable to the scrofulous order. It has appeared to me necessary to say thus much on the limit assumed, because in many pathological collections I have found the same morbid alterations of structure in reference to the bones indifferently called rachitic and scrofulous. Thus the adipoceroid degeneration of bone, resulting from acute or inflammatory mollities ossium, is, in one collection, called *rachitic* softening of the bones, and in another, *scrofulous* fatty deposit.

There yet remains to be noticed a condition of the body, constitutional in its nature, and more especially referable to the nervous system, the *hysteric*, which, though perhaps never an actual cause of deformity, nevertheless exerts considerable influence in forwarding its progress. Hysteria, whether hereditary or acquired, is a very frequent and troublesome complication, liable to manifest itself under similar circumstances, and at the same period of life, and to be fostered by

the like influences as those which favour the formation of spinal curvatures in general, but more especially the *lateral* variety of the *adventitious* order.

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Simple adventitious lateral curvature.

## CHAPTER IV.

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DEFORMITIES NOT ESSENTIALLY CONNECTED WITH ANY COGNIZABLE MORBID CHANGE IN THE VERTEBRÆ, OR INTER-VERTEBRAL SUBSTANCES, BEYOND THAT OF FORM.

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### ADVENTITIOUS CURVATURES.

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PERNICIOUS INFLUENCE OF CONSTRAINED POSTURES—OF UNBALANCED MUSCULAR EXERTION — SPINAL IRREGULARITIES IN ARTIZANS—SAILORS—VINE-CUTTERS—MECHANICS—CLERKS—



LUNATICS—NURSERY MAIDS—ARTISTS—MINERS—ENGINEERS, ETC.—CURVATURE OF SPINE ARISING FROM A DISPARITY IN THE LENGTH OF THE INFERIOR EXTREMITIES—BAD HABITS—POSITION IN BED—PECULIARITIES OF SUCH CASES—TREATMENT OF SIMPLE ADVENTITIOUS DEFORMITY—REMOVAL OF EXCITING CAUSE—DIFFICULTY OF CORRECTING BAD HABITS—CONSTRUCTION OF BOOTS AND SHOES—PROPER EXERCISES—ARTIFICIAL ROWING—ROCKER EXERCISE—LATERAL EXERCISES—STEEL SUPPORTS—CURVATURES PRODUCED BY PLEURAL ADHESIONS—PLEURODYNIA—CONTRACTION OF ONE SIDE OF THE CHEST—CURVATURE FROM OTHER CAUSES IMPEDING THE PLAY OF THE THORACIC PARIETES.

IF the vertebral column of an individual enjoying even robust health and a faultless constitution, be long and steadily subjected to a constrained position, disposing it to incline in any particular direction, so as to render the pressure on the intervertebral cartilages unequal, it will, at length, become fixed in that position. The length of time requisite to effect such a change will, of course, vary with the age of the party, and the natural powers of resistance inherent in the spine. During youth, while the development of the body is in progress, a deviation will, *cæteris paribus*, be more easily and speedily effected than at a later period of life, and this for reasons too evident to require comment. If to a forced position of the body be added partial muscular exertion, of a nature calculated to aid and forward irregular deflexion of the column, the progress of curvature will be more rapid, and a permanent character will be still more

easily imparted to it. Examples of deformity so produced are to be met with among persons whose occupations lead them, for a length of time daily, to assume a constrained position, while at the same time they are making some considerable partial muscular exertion. Thus it is that certain labourers and artizans have one shoulder a trifle higher than the other, and that nursery-maids who carry their charge always on one arm are liable to become crooked. The spine indeed, may be not only laterally, but variously inflected, from numerous causes of this description. Sailors, for example, often have the spine bent forwards,—a characteristic which Smollett did not neglect to bestow on his *beau-idéal* of a British seaman, Commodore Trunion. This stoop, or bend in the back, is most remarkable in men who serve on board ships of the line, or other vessels having several decks; the height between which is scarcely sufficient to permit a man of ordinary stature to stand upright.

In France, many of the vine-cutters contract a permanent rotundity between the shoulders, increasing in some instances to a decided hump. When working among the vines they are obliged to continue long in a stooping posture. Persons long affected with chronic rheumatism of the dorsal muscles, are also liable to contract an anterior

inclination of the spine. Of this description is the sketch here delineated.\*



The above specimen illustrates another circumstance worthy of notice, but not easily transferred to so small an engraving,—namely, that

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\* From the late Mr. Liston's collection.

when curvature, even in a *healthy* individual, has proceeded to such an extent as to materially disturb the centre of gravity, without being able to effect a counter-curve to remedy the inconvenience so produced,—nature, as it were, steps in and arrests the further extension of the deformity, by depositing extra bone to strengthen the concave aspect of the curvature, in the situation where the column most requires assistance and support, viz., at the margins of the bodies of the several vertebræ; which, in the instance represented, were thickly encrusted with an osseous deposit that had effectually opposed any further yielding of the column of bones from the normal direction.\*

It is notorious that artizans in general contract

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\* The same circumstance occurs in the shafts of the long bones after rickets. When these have been much bent during the early period of the disease, a very considerable increase of earthy matter is often to be observed deposited on the concave aspect of the curve, where the weakness may be supposed to have been greatest. To such an extent, indeed, does the deposit of new matter sometimes take place, that not only is the bone, at the point of curvature, converted into an unusually solid dense mass, but the medullary canal may be wholly filled up in a similar manner, and obliterated. It may be presumed, that nature had here deposited an additional quantity of earthy material, because the central and most curved part of the bone, being the least capable of resistance, most required subsidiary aid.

There is, however, another circumstance that has been con-

some bend or twist in their spine or limbs, so characteristic as to enable a practised eye easily to judge of their pursuits, without any other information than that which is derived from their appearance. Clerks, and other persons who sit much in one position and lead a sedentary life, frequently contract a lateral curvature, and become what is called "side-bent."

Deranged persons will sometimes obstinately maintain for months, or even years together, a favourite position, subversive of the natural equilibrium of the trunk, by which permanent curvature may be established; and this, even at an advanced period of life, when the bones have attained their utmost firmness. Of deformity produced in this manner, a lunatic lady under my care a short time ago, afforded a very remarkable example. She did not become deranged till she had reached her forty-fifth year, and ever after stood in the same attitude daily for twenty-five years.

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sidered as forming a part of the explanation of this fact, which it may be as well to notice. At the part most bent, the cartilaginous matrix of the bone being exposed to the greatest degree of pressure, contains a larger quantity of nidus than is natural. Hence, when the restorative action of nature afterwards sets in, it has been imagined that this compressed nidus may afford a facility for the deposit of a larger quantity of earthy material than could be contained in a similar extent of healthy bone.



The curvature thus produced was contracted by the habit of holding the left hand constantly to the side of the head,—the head being at the same time inclined obliquely in a corresponding direction to meet it, so that the neck became finally immovable, and fixed at so acute an angle, that the chin pressed firmly on the central portion of the clavicle, and to such a degree as to keep the integument covering the part in a state of continued superficial ulceration, unless protected by the interposition of a few folds of lint.

It is in this manner that certain religious fanatics among the fakirs of India lose the power of moving those parts of the body which they have long held in a state of continual restraint.

“A tumour on the head or jaws,” says Sir Charles Bell, “which makes a child carry the head to one side; or constant stooping, such as is used by a girl working at the tambour; or the carrying of a weakly child always on one arm by a negligent or awkward nurse, will cause in time a fixed and irremediable distortion,—the result of the compression, and consequent absorption of the intervertebral substance.”

“Young artists,” observes Mr. Shaw, “of both sexes are liable to lateral curvature from adopting a habit of sitting before their paintings and drawings, with an inclination of the body to the left

side; with the left arm resting on the elbow, or hanging by the side; sometimes with a palette in the left-hand, whilst the right arm and shoulder are raised for the purpose of directing the pencil, and the head is directed to the left shoulder." In this position the spine is kept in a state of lateral curvature for a long continuance of time. Dr. Harrison informs us that the colliers of a particular mine in Lancashire being obliged, from the thinness of the stratum, to sit in a bent posture, and force their right side into the vein while digging out the coal, have the spine in process of time curved towards the right side.

In a similar manner was produced the example of curvature at the head of this chapter. The subject of it was an operative engineer,—a powerful, and in other respects, a well-made man. A similar inclination of the spine is sometimes produced in young ladies, who devote much time to learning the harp, and are not particularly attentive to their mode of sitting. But in this case the curvature is in the opposite direction; its convexity tending to the right side. The habit of sitting or standing much, in short, in any objectionable or unnatural posture, especially during the period that the body is growing, may produce at last irremediable deformity; the intervertebral substances, where most squeezed, must necessarily in

the course of time suffer absorption, and the connecting ligaments in consequence contract, and accommodate themselves to the altered form of the bones.

Ploughmen,—a most healthy order of society, whose bones may be presumed to be of the firmest texture, and whose muscular structure is of the stoutest, —have generally the right shoulder a little elevated, and more advanced than the left. This, together with the awkward step, characteristic of this class of persons, may be attributed to the greater exertion made with the right side,\*— one foot being at the same time always in the furrow, when engaged in their daily avocation.

The halting step, so imparted, might alone produce deformity, in one predisposed, by a reverse train of actions to that by which curvature is known to produce a shuffling gait. I have at the present time under my care a young lady, eighteen years of age, of undeniably good constitution, who has lived in the country all her life, and never been

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\* It must be borne in mind, that when any considerable muscular exertion is made with the *right* side, involving the trunk, while the centre of gravity is thrown on to the right leg, the muscles which support and fix the spine on the *left*, act in a corresponding degree; indeed, with greater power, in order to steady the column, afford a fulcrum, or *point d'appui*, and counterpoise the operations of the active side.

subjected to any improper constraint, either in dress or habits, who is, nevertheless, very crooked. She has a slight congenital mal-formation of the left foot, which causes her to walk a little lame, and to which circumstance alone there is every reason to attribute her present deformity.

At schools, where the boys, when learning their lessons, acquire the habit of supporting the book on their knees, and stooping over the task for hours daily, it is no uncommon thing to find them become awkward, round-shouldered, and full-backed. The intervertebral substance, under such circumstances, being unequally compressed by the inclination of the spine forwards, becomes misshapen, and a slight degree of excurvation is in this manner imparted to the column. On leaving school the posture is discontinued, and, the pride of youth causing them to amend their carriage, the vertebræ are then no longer subjected to unequal pressure, the absorbed texture is replaced, and the symmetry of the spine is ultimately restored.

It was observed by Boswell, in his *Life of Dr. Johnson*, that among the male population of London, the practice of giving the wall by the left, and taking it by the right shoulder, which originated in the narrow crowded streets of the city something more than a century and a half ago,

had given an advance to the right shoulder, and an obliquity to the trunk, by which some have imagined that Londoners might be easily distinguished amongst other men. This custom, even common at the present day, vain new comers often awkwardly imitate, conceiving the style of walking so imparted to be fashionable.

These facts, it is presumed, will assist in furnishing a reply to a question that has been much canvassed; viz., whether the spine ever deviates from its natural course, independently of constitutional predisposition?

The influence of occupation in individuals of a decidedly healthy class, is a proof that the deformity may sometimes be referred to muscular action of a purely incidental character, which does not in any way vitiate the general health.

As muscular action, when unbalanced or unequally antagonized, may induce deformity, so may it, when well and judiciously directed, contribute to health and the prevention of a vicious development of the frame.

Rowing, fencing, the practice of single-stick, boxing, dancing, and such like exercises, generally contribute to preserve the symmetry of the spine entire, and improve the general carriage. Daily drilling speedily converts an awkward high-shouldered slouching countryman into a well-formed



upright soldier. Tight-rope dancers, tumblers, and circus-riders, are generally well-made athletic men. In considering these facts, we at once forcibly see much that must enter into the principles on which physical deformity is to be remedied or prevented.

Neither must we omit to enumerate, among adventitious curvatures, such as proceed from some disparity in the length of the lower extremities; whether the inequality be of accidental origin, congenital, or the result of disease and unequal development.

“A diseased bone may grow less rapidly than the corresponding bone which remains in a healthy state. Thus, in a case of scrofulous affection of the bones of one finger, it is very common for the finger thus affected not to grow at all, while the other fingers grow as usual. The reverse of this also may happen, and the diseased bone in certain cases becomes actually longer than its fellow of the opposite side.”\*

The theory assumed by Glisson, which attributed deformity to the unequal development of the vertebræ themselves, was revived by Mr. Bampfield, who maintains that it had become obsolete in opposition to the evidence of the most perfect

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\* Brodie's *Clinical Lectures*.

of our senses : “for,” says he, “in the anatomical museums, specimens of deformity arising from the irregular and unequal growth of bones may be seen ; in some of which the malformation or inequality is produced by diseased actions ; but in others, simply by an exuberance of the ‘*formative principle*,’ or by an error of nature, in exciting a pruriency, or occasioning a deficiency of growth.”\*

There is also a variety of paralysis that occurs during infancy and childhood, in which the growth of the limbs, in consequence of diminished nervous energy and want of healthy exercise, becomes unequal. But, as this affection will be hereafter considered, it is unnecessary for me to allude to it further at present. Acute disease in a limb, by creating a necessity for absolute rest, may impede the development of its osseous, as well as of its other structures.

When from any adventitious circumstances the axis of the pelvis becomes vitiated, so as to derange the level on which the spine is based, the column of vertebræ, in order to maintain the natural centre of gravity, necessarily inclines to one side, and very often at the same time somewhat forwards. Such an event, it is clear, may

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\* Bampfield *On Curvatures and Diseases of the Spine*, p. 76.

happen equally to individuals of either sex, in full health or otherwise, at any age, who may or may not be predisposed to curvature of the spine. Thus, a mal-adjusted fracture of the thigh bone, an unreduced dislocation of the hip joint, a disease of the hip joint, a club foot, and the like, by shortening the injured limb, may disturb the axis of the pelvis, and occasion lateral curvature of the spine; nay, even inflamed corns, or a toe-nail which grows badly and occasions pain, may cause a child so far to avoid the natural bearing of her foot in walking, as indirectly to produce the same result by deranging the axis of the pelvis.

In all these cases the spine generally yields first in the *lumbar* region; and, in the course of a very short time, nature attempts to rectify the centre of gravity by the establishment of a counter-curve between the scapulæ.

As the consequences in such examples can be foreseen, prevention is easy; at least it is more so than cure. This is to be effected by the use of appropriate apparatus to form a substitute for the want of equality in the length of the limbs. Thus, supposing the disparity to arise from mal-united fracture or an anchylosed hip joint, a high-heeled boot, or an iron toe-prop, may be all that is required. If it proceed from contraction of the tendo Achillis, a division of this part, supposing

the case to be one that will admit of such an operation, with subsequent appropriate extension, may enable us to rectify, and ultimately to elongate, the extremity to its original, or to its proper length.

Whenever the level of the pelvis is by such means restored to its natural line, if the person be young and growing, nature will, in the course of the further development of the frame, remedy the deformity proceeding from the primary mischief.

Sometimes the disparity in the length and development of the lower extremities is a congenite, or an hereditary defect; we should, therefore, in all cases of curvature, suspected to arise from such a cause, carefully measure the legs, taking as fixed points the trochanter major, and malleolus externus.

Inequality in the growth of the lower extremities, indeed, is a cause of curvature of much more frequent occurrence than is commonly supposed; and its detection by measurement, when the disparity is but trifling, is often very difficult. To the history of the case, then, we must look for further facts by which our diagnosis may be aided.

Thus, when the inequality is the *cause* instead of the consequence of curvature, we shall find that the young person was observed to halt or shuffle in walking for a length of time previous to any

difference in the height of the shoulders, or other symptom of deformity, being observed. Whereas, when an *apparent* disparity in the length of the legs, and a halting gait, are the *result* of curvature, which, as will hereafter be shewn, is often the case, it is more than probable that the symptoms of deformity will attract notice for some time anterior to any change taking place in the manner of walking; and when we examine the spine, we shall find that the lumbar curve has made a considerable advance. Unequal development is seldom limited to the *length* of the inferior limbs, but includes their *volume* in every respect, and more or less obtains in the two halves of the body generally.

In addition to using appropriate mechanical means of equalizing the support of the body, such as a thick cork, or false sole, or some similar contrivance,—for the difference of length rarely exceeds half an inch,—we may have recourse to various auxiliary remedies calculated to accelerate the growth of the defective side. Of this kind are friction, and shampooing, the douche, and, in dull phlegmatic habits, the application of electricity. These may be aided by the shower or plunge bath, and sea bathing, generous diet, and such tonics as the state of the constitution seems to require. If the faulty growth be not rectified on the individual attaining maturity, we

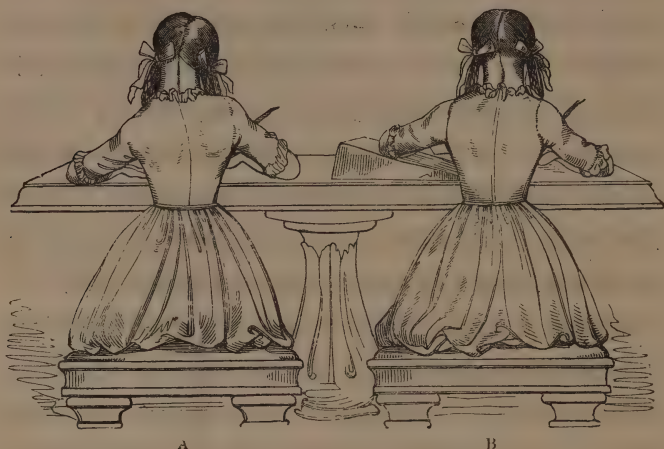


are not likely to effect much improvement after that period. During the time that appropriate remedies are being used, there is no reason why we should not enjoin the daily practice of some of the exercises to be hereafter indicated as proper in cases of ordinary lateral curvature. If we be fortunate enough to succeed in increasing the length of the shortened limb, we must take care to have the cork shoe-sole proportionately reduced in thickness, and ultimately removed altogether.

When a young person has acquired injurious habits, either as regards the manner of standing, sitting, writing, drawing, or lying in bed, we must, of course, in the first instance, insist on the necessity of correcting these, as preliminary to the employment of other means necessary to meet the exigencies of the case.

For example, a bad position habitually assumed whilst engaged in writing, can be corrected by the very simple contrivance delineated on next page; viz., a wedge-shaped cushion, introduced under the left elbow, so as to raise the left shoulder to any desired height, and thus alter completely the position and bearing of the trunk. A momentary glance at the wood-cut, fig. A, will suffice to illustrate the bad consequences that might result to a girl somewhat crooked, whose mode of sitting, whilst engaged at her ordinary studies, is not care-

fully attended to : and the facility with which these might be counteracted is equally exemplified in fig. B.



Dr. Zinc, in his *Report of the Orthopædic Institution at Vienna*, expresses himself very strongly on the evil tendency of the habit of always sleeping on the same side of the body in a soft bed. From long attention to the subject of spinal deformity, he is convinced that this is one of the most frequent causes of lateral curvature, as well as of its continuance ; and an agent, as he very justly remarks, in operation during a period equivalent to one-third of the patient's daily existence. Presuming the young person to lie on the right side, Dr. Zinc remarks : “ the head leans towards the left side, and the lung on that side is compressed, one lung only (the right) performing its

full office; and the muscles of respiration on that side are in a state of activity greatly exceeding that of the left." . . . "He has also" ascertained that "the convexity of the deviation of the spine accords exactly with the insertion of those muscles which are most active in the process of respiration. This deviation from the perpendicular so high up in the spinal column is very liable," he imagines, "to be overlooked; the inferior and secondary contortion to the left side in the lumbar-vertebræ, being in such case regarded as the primary affection."

In deformity, such as has been thus far described, the *exciting* causes do not produce their influence through the medium of any error of the constitution, or by primarily inducing loss of physical power. On the contrary, in some instances, by exercising exclusively, and thus invigorating, certain muscles, they enable them to exert more power than their antagonists. In other examples, it would seem that position alone is sufficient for the production of the curvature. In the lapse of time, in either case, the intervertebral substances, being exposed to repeated or to long-continued and unequal pressure, become partially absorbed and wedge-shaped at the compressed portion of their circumference, so that the edges of the vertebræ are allowed to approximate each other in a slight degree on that side; while, on the opposite side, the

margins of the vertebræ are, in the same proportion, unduly separated. Certain changes are likewise at the same time gradually established in the ligamentous appendages and muscles attached to the spine, by which a permanent character is imparted to the curvature; but these will be better considered hereafter.

There is one peculiarity in these simple curvatures,—they are generally single, and occupy pretty nearly the whole length of the spine, provided they have not been produced by a disparity in the length of the inferior extremities, and the person have enjoyed good health during their formation. This observation, however, applies more especially to curvatures formed *after the age of puberty*. Should such causes as have been enumerated operate in a young person, or in one naturally predisposed to distortion, the spine will of course bend more readily; and a counterpoising inflexion in the opposite direction to that first established will, in all probability, speedily present itself.

To sum up the characteristic features of simple adventitious curvature, they may be thus enumerated :—

*First*.—When the spinal apparatus is healthy, and endowed with the full power of resisting distortion, the curvature is seldom very considerable, and never equal to what it would be, *cæteris pari-*

*bus*, if aided by the predisposing circumstances that favour its production in individuals of delicate habit. The pathological changes do not proceed beyond an alteration in the form of the intervertebral fibro-cartilages.

*Secondly.*—The same vital power of resistance prevents, in the majority of instances, the formation of more than one curve, especially in such cases as supervene after the establishment of adult age.

*Thirdly.*—In those cases in which the centre of gravity is displaced without being reclaimed by a counter-curve, the head is not carried perpendicularly to the pelvis, unless by an unusual muscular effort, of which the person is conscious.

*Fourthly.*—The power of resistance already alluded to being great, the spine is able to withstand the muscular efforts made to maintain the equilibrium of the trunk, and is not liable to become semi-rotated, or twisted on its axis. Hence the great displacement and distortion of the ribs, which characterize the advanced stages of curvature occurring under other circumstances, as will hereafter appear, do not happen in this modification of deformity; or if they supervene, it is only in a comparatively trifling degree.

*Treatment of simple adventitious curvatures.*—As persons affected with this form of spinal inclination are presumed to be in the enjoyment of



good health; or at least not necessarily enfeebled by any debilitating influence; the means employed for its removal reduce themselves to such as accomplish their end in a physical, or mechanical, manner. As the special application of such means must bear a direct reference to the exciting cause in individual cases, and be left in many instances to the inventive genius of the surgeon or mechanician, it only remains for me, at the present moment, to point out the principles which must guide us in their selection.

In my introductory observations, and in the general history of adventitious curvatures, just given, many preventive and curative agents have been incidentally enumerated—of which the reader will now have no difficulty in availing himself; hence, it will not be requisite for me to again recall these to his attention.

The first thing necessary is to ascertain the exciting cause, and to insist on its removal, or discontinuance, if practicable. If this be impossible, mechanical means and exercises, calculated to counteract its evil tendency, must be devised. If the curvature arise from any bad habit, such as that of holding the head to one side—a much more frequent source of slight deformity in young ladies than is usually imagined—or sitting in an objectionable posture while engaged in any

particular occupation, such a habit ought to be corrected; and for a time, its reverse, perhaps, as far as possible, may require to be observed. To rectify bad habits, however, such as have been pointed out, simple as it may appear, is often a task attended with considerable difficulty, requiring the utmost care on the part of the patient as well as the corrective eye of a vigilant superintendent. In reversing a position, or action, for example, the weight of the body should be so thrown that the centre of gravity may accord with the new posture or action in the same manner that it did with the old: an object sometimes not very easy to be attained, after the original position has become confirmed by habit. Without a due attention to this circumstance, more injury than benefit may accrue from the discipline. If a person who generally uses his right hand, be desired to substitute his left,—say, in the ordinary actions of life,—it is probable that, until corrected, he will neither reverse his position nor alter the centre of gravity of the body to correspond with the change of action, but retain, in both these respects, those to which he had been accustomed. A fault of this description may often be observed in young ladies, when seated at the piano, more especially if they are tightly dressed. They generally favour the movements of the right hand, in performing on the

upper part of the key-board, by a corresponding inclination of the body; but they are very apt, when using the low notes, not to reverse the position of the trunk in a manner to correspond with the alteration of position required,—but to cross the right hand over the body, while the bust continues still somewhat inclined to the right side; such performers generally play the bass part of the instrument in an awkward, feeble, and ineffective manner.

Supposing the inclination to arise from inequality in the growth of the inferior extremities, or, what is more likely, from inequality in their length, in consequence of a mal-adjusted fracture, or unreduced dislocation, artificial means must be contrived by which the length of the legs may be equalized. Lameness, arising from inflamed corns, bunions, and the like disorders affecting the feet, it need scarcely be observed, should be removed as a preliminary to such exercises as may afterwards be judged necessary for the rectification of the spine; and the greatest attention should be paid to secure a proper construction of the boots and shoes in future. Mr. Amesbury, in his *Observations on Deformities*, p. 191, in allusion to this cause of spinal inclination, has given some very useful directions in reference to the manner in which the measure for shoes should be taken, and

pointed out the principle on which this ought to be done. Ladies who are not troubled with corns or bunions, might perhaps object to wear shoes made to measure in accordance with Mr. A.'s directions; but they may rest assured, that the suggestions offered by him are very judicious, and well worthy of attention as regards children and young persons, while the feet are growing; and, as the advice given cannot be too widely disseminated, I shall here avail myself of his directions.

“Both feet should be measured, partly in the erect and partly in the sitting posture. . . . The first measure should be taken with the person standing upon the measure. The measure round the toes should be taken in the standing posture, with the foot bearing upon the ground. The first gives the extreme length of the foot, when the arch has yielded under the influence of the weight; the second gives the spreading of the toes. The third and fourth measures (that is, on a level with the ball of the great toe, and about an inch behind this) round the foot, should be taken when the foot is lifted from the ground: all the other measures to be made according to the usual rules which shoemakers are accustomed to follow. The object of this mode of measuring is to cause the shoe to support the metatarsal bones, and to ensure sufficient room for the toes. The support

of the shoe should be felt by the wearer, *above the toes and not upon them. The toes should have room to move freely, and not be pressed upon by the shoes at any part.* When these rules are duly acted upon by observant persons who have acquired experience in this mode of measuring, the shoe gives no more inconvenience to the wearer than a glove, and at the same time affords considerable support to the foot, which is preserved in its natural symmetry and beauty, free from corns and bunions.”\*

Presuming the exciting cause to have been removed, or its influence nullified by the means pointed out, the further management of the case may require that the muscles, connected with the vertebral column and trunk in general, be exercised in a manner the reverse of that which there is reason to believe favoured the formation of the curvature. Or, in lieu of such counteracting muscular exertions, which are not always practicable, may be substituted special calisthenic movements, or games converted into exercises, according to the age of the party. Some of these

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\* Sir Benjamin Brodie, in his *Observations on Corns and Bunions*, page 213 of his *Lectures on Pathology and Surgery*, has likewise published some very useful and practical remarks on this important subject, which those afflicted with the diseases in question would do well to study.



have been already detailed, and others will easily suggest themselves to practitioners conversant with the physiology of the muscular system. Repeated flexion of the body over a tressel of convenient height; turning a weighted wheel with one hand, or with both, if requisite; working a spring, or pulley; climbing a rope, to which stops are attached for the hands; or, what is better, a short piece of ladder, suspended from the ceiling of the room, the cross bars of which are set near,—that is, at the distance of three or four inches only apart from each other; or simple suspension by one or both hands, as the case may seem to demand, the arms being, at the same time, kept fully extended. Thus, when the inclination is single and seated in the lumbar region, the party should hang suspended by both hands for several minutes at a time repeatedly in the course of the day. Should the curve be inter-scapular, and its convexity directed to the right side, then suspension by the left hand is most suitable. Equilibrium exercises are also very useful in these cases. Of this description are walking on a rope or pole, as already explained (p. 47), balancing a rod in each hand, or on the forehead, and the like; and artificial rowing and swimming. For the purpose of enabling patients to perform these, some simple contrivance is requisite. The annexed chair for

rowing is designed after a plan suggested, I believe, by Mr. Coles, of Harley-street. It answers the purpose very well, and can be easily constructed by any carpenter.\*



But perhaps the most useful of all movements for the rectification of the cases now under consideration, are *lateral* exercises,—a mode of using the spinal muscles generally too much overlooked; in consequence, perhaps, of the want of some simple mechanical means of exercising the body in this direction. For such purpose, I have been in the habit of recommending a frame somewhat like that on which a rocking-horse stands, but rather more acute in the curve, and having the

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\* A spring roller of any power that may be desired can be passed under the seat; and to the extremities of this, on each side, the rowing handles are to be affixed.

ends turned inwards towards the patient, instead of outwards. The mode of using this simple contrivance, which requires a little practice, will be gathered from the annexed wood-cut.



In 1844, Mr. Stafford published some observations on *lateral curvature*, in which he specially recommended the same practice, and considered it to be the most useful exercise of any. He also suggested for the purpose a frame similar to that represented above, — the patient supporting herself by ropes hung from the ceiling of the room. I am therefore glad to perceive that others as well as myself have found the plan useful. But the editor of the *British and Foreign*

*Medical Review*\* seems to have fallen into an error, in ascribing to Mr. Stafford the originality of this plan of treatment. The reviewer's concluding remarks are—"This leads us to observe, that Mr. Stafford's practice is new, so far as regards the point of *lateral exercise*, and the machine he has devised for its performance; we certainly do not recollect any previous proposal to call the muscles of the spine into action in this particular direction." Now, I not only proposed this kind of exercise in an essay *On Spinal Deformities*, published in 1830, but gave a lithograph of an apparatus intended to carry it out, resembling that delineated on the preceding page. I did not conceive I was then introducing a novelty, because the advantage of this mode of exercising the muscles struck me as being too apparent to have escaped notice. But if there be any merit or novelty attached to it, I certainly feel that my claim is prior to that of Mr. Stafford.

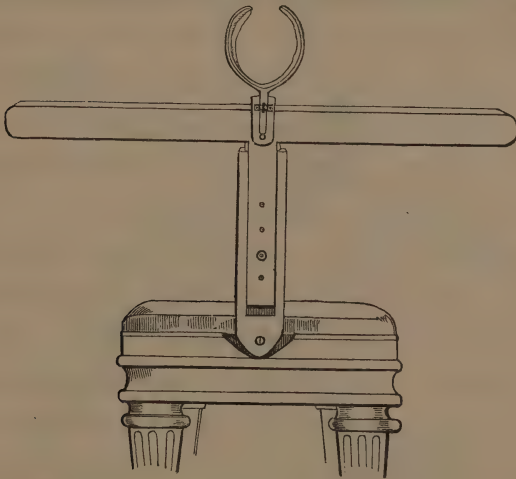
It will be observed, in using the contrivance above delineated, that the impulse is given by the weight of the body being thrown alternately on each leg, so as to destroy the equilibrium of the rocker; and not by *pulling* one end of the frame up towards the body, as might, at first sight, be

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\* Vol. xviii, page 227.

inferred. Were the movement imparted in this latter manner, it is clear that the body would incline in the opposite direction to that here represented, in order to recover the centre of gravity.

A plan for exercising the body laterally was long ago proposed by the late Mr. Sheldrake; the merit of originality therefore is properly due to that gentleman. The subjoined drawing represents a modification of the apparatus suggested by him; the head-spring being a contrivance of my



own, which I have found necessary to secure an equal and uniform flexure of the *cervical* portion of the spine along with that of the column in general. It slips into a plate which moves on a circular hinge; so likewise does the lower part of



the upright, both being furnished with stops to limit the movements within the necessary extent, and to prevent the party using the frame from overbalancing herself. The upright also is dovetailed, so as to admit of its upper half sliding into the lower; the cross-bar may be adjusted at any convenient height to suit various patients in succession. The head-piece consists of two padded flat elliptical springs, about three inches broad at the top, and tapering somewhat to the base, where they meet. Between these the head is allowed to recline, so that the ears may be on a level with



the shoulders of the patient. The mode of exercising with this contrivance will be readily understood by a glance at the illustrative wood-cut above.

Elliptical brass handles are screwed to each end of the cross bar, which enable the patient to work the machine, and prevent herself from falling, when laterally flexed to the necessary extent. The peculiar advantage of this plan of exercising is, that the lateral movements of the trunk are more perfectly measured and regulated than they are by the rocker; hence, in many cases, it may be deemed a preferable mode of calling the muscles of each side of the trunk into alternate action. But perhaps, the best and most simple manner of exercising the body laterally, when the aid of a second person can be obtained, is to let the movements be free of all mechanical control; the extreme point of flexion being limited, if necessary, by the hand of an assistant (governess, nurse, or maid), placed under the false ribs on each side of the body. The party so assisting ought to stand behind the person exercised, and keep her spine from swerving off the direct lateral line.

It must also be borne in mind, in reference to *lateral* movements, that if the spine be curved only in one direction, it ought to be exercised in such a manner as to call those muscles especially into action which most require restoration by such means. Thus, if the curve be single, and its convexity be directed towards the right hand, the patient should perform the lateral flexure to this

side five or six times for once in the opposite direction. A double curve, or sigmoid flexure of the spine, requires that the movement be performed alternately to each side. These remarks equally apply to all gymnastic and calisthenic exercises: to render them special, the muscles that most require developing ought to be called most frequently into action.

When curvature occurs in a young person of feeble physical powers, the spine may require support during the intervals of exercise. In such case, while sitting, and for house use, short or dwarf crutches strapped round the body and passing between the axillæ and a board placed across the seat, are the best. When the patient is out of doors, and walking about, the support must of necessity rest on the pelvis, and steel crutches, similar to those shewn in the next page, figs. 1 and 2, will be found to answer every purpose.

Both of these supports are furnished with padded springs, A A, which fit over and encase the pelvis, resting at numerous points on the ossa innominata and sacrum; hence, their base is firmer, and affords a more fixed rest than when the pelvis is merely encircled by the spring girdle, B B, padded, and covered with leather, as is frequently recommended.

Fig. 2 is furnished with side wings, c c, to sup-

port and, if necessary, compress the ribs at their angles. The spring supports, D D, pass under the axillæ, and apply, by oval padded shields, E E, against the fore part of the shoulder joints, so as to prevent the spine falling forwards. Cases occasionally present themselves in which this latter stay may be a desideratum; but in general, the simple crutch, fig. 1, is the best contrivance.\*

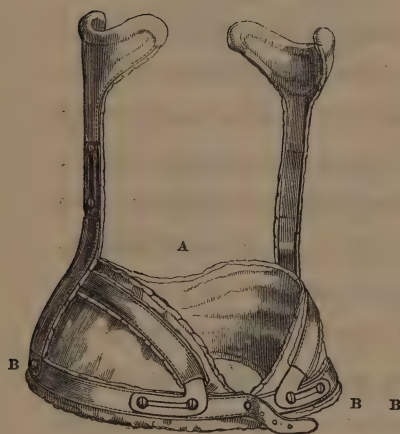


Fig. 1.

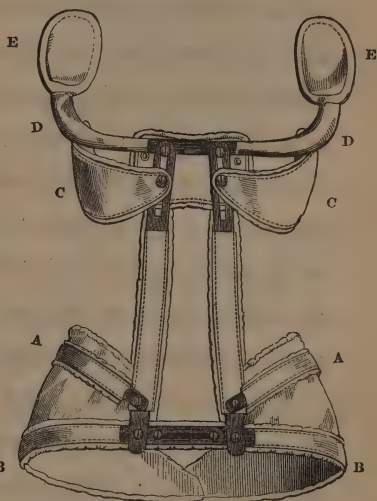


Fig. 2.

Before quitting this subject, I must not omit to

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\* Fig. 2, indeed, is more particularly suited for supporting the spine in cases of diseased vertebrae; the angular projecting portion of spine, in such cases, passes between the two uprights that spring from the pelvic base of the machine, and the column is thus supported without the diseased part being pressed upon.

enumerate, as belonging to the simple adventitious order of curvatures, those cases which arise in consequence of external, or other disease, unconnected with the spine. A large tumour projecting from the neck may compel the person to observe a position so subversive of the equilibrium of the body, and so far permanent in duration, that the intervertebral cartilages may become absorbed, and curvature of the column be induced. Adhesion of the pleuræ, rheumatism of the intercostal and sternocostal muscles, by restraining the play of the costal parietes, lumbago, and even chronic affections of the kidneys, have been known to produce the same effects, and in a similiar manner, by compelling the patient to maintain a bent position, until at length the intervertebral cartilages were absorbed in consequence of pressure, and permanent curvature of the spinal column was produced.

There is another very important source of curvature of the kind we are now considering, which must not be passed over,—viz., that arising from collapse of the lung, and sinking in of the chest on one side, in cases of empyema. It occurs in young persons after a collection of purulent matter has been evacuated from the cavity of the pleura.

The annexed sketches, A and B, taken from a case of this description, illustrate well the character of lateral curvature produced in this manner.





The structural changes which may ensue from the existence of disease of the heart or pericardium, by inducing the patient to lean forwards, and to one side, for the purpose of obtaining relief from pain or dyspnœa, may also give rise to a disparity in the dimensions of the two halves of the costal parietes. The same consequences may likewise proceed from frequent relapses of sub-acute pericarditis, followed by the effusion of fluid within the pericardium.

It does not appear, however, that curvature thus produced ever becomes an object of surgical treatment; its occurrence, therefore, only requires to be noticed among other symptoms of greater im-

portance, which serve to indicate the stage and duration of the primary cardiac disease. In these cases it may be remarked that the physical effects on the contour of the chest are seldom considerable, and therefore that the deformity proceeding from them is proportionately trivial, unless it be aggravated by a specific diathesis. The misfortune is, that if, while the body is growing, the balance between the two sides of the trunk be subverted in the slightest degree, and a morbid bias then given to the direction of the spine, there is no determining to what extent it may proceed. After adult age, there is little or nothing to apprehend in this respect. Happily, in most cases, before those changes can be established, which would render the spinal deviation a permanent deformity, some salutary accommodation is effected in the part that had been the seat of disease, after the original disorder to which it owes its birth has been subdued. The pleural adhesions, for example, may become sufficiently elongated to liberate the costal parietes, and thus to admit of the subsequent removal of the curvature, either by the natural efforts of the system, or by the very simple physical means that would be appropriate in a case of the same kind, arising from the operation of ordinary causes.

Not so, however, when hepatization of the lung, or collapse of this organ after the evacuation of pus

from the cavity of the thorax, is the source whence the disproportion between the two sides of the chest proceeds. In these cases, we can do little beyond supporting, or propping up, the sinking side, in order to obviate, as much as possible, the increase of the deformity. For this purpose we may recommend the use of short, light, steel crutches, to pass between the pelvis and axillæ,—the construction of which has already been explained. All other mechanical interference is useless; and physical treatment, it is equally evident, can prove of no avail, unless we could restore the condensed lung to its primitive dimensions, and to the exercise of its natural functions.

In Dr. Watson's *Lectures on the Principles and Practice of Physic* (p. 111), are to be found some observations so pertinent to this subject, that I may be readily excused for quoting them:—  
“When the effused fluid begins to be re-absorbed, and when some cause or other, generally the formation of adventitious membranes, prevents the lung from re-expanding, and approaching the ribs, in proportion as the fluid is removed, then of course the ribs *must* sink in, and approach the lung, to prevent that void which would otherwise exist between the ribs and the lung. Consequently, that side of the chest on which the fluid has existed becomes narrower than the sound side.

And the actual difference between the two will be augmented by the circumstance that, in such cases, an amplification of the sound lung, and of the cavity in which it is lodged, a true compensatory hypertrophy, commonly takes place.

“This partial or general retraction of one side of the chest is not so much a sign of disease actually in progress, as of disease gone by; and it may exist without evident disturbance of the health of any kind.

“Persons who are thus affected, have the appearance of being inclined towards the diseased side, even when they endeavour to hold themselves upright; and the deformity, for such it is, becomes manifest to the eye when the chest is uncovered. You see that the side is narrowed and shrunk. All its dimensions are contracted. It measures less in circumference by an inch or more than the other side. The shoulder is depressed; the hypochondrium is tucked up; and the ribs are drawn close together. A patient of mine, whose chest had been punctured, and who drew off daily, with a syphon, pus which did not otherwise find vent, *had such difficulty at last in introducing the tube between his ribs, that excision of a piece of the bone was contemplated* by the eminent surgeon who had performed the operation. The effect of the atmospheric pressure is



sometimes so great as to crook the vertebral column, and *produce lateral curvature of the spine*. This I have myself witnessed. And as one of the unseen walls of the cavity, namely, a part of the diaphragm, is carried permanently up under the ribs, so another of the unseen walls, the mediastinum, is liable to be influenced by the tendency to contraction. The heart, which, when the *left* pleura is distended, is apt to be *thrust* over, beyond the sternum on the right, may thus, when the *right* pleura is *contracted*, be dragged into the same position.

“The difference of the two sides is so striking, that at first sight an observer supposes it to be even greater than it is actually found to be by admeasurement. Yet, Laënnec tells us, that he had met with this deformity in persons who were not themselves aware of its existence. But all such persons had suffered some long disease, which appeared to be situated chiefly in the thorax.”

I should scarcely have considered it necessary to insist so much on adventitious deformity arising from this latter class of causes, had I not known cases of contracted and sunken thorax, so produced, to be mistaken for examples of ordinary lateral curvature, and ignorantly treated by calisthenic and similar means.

I have said nothing in relation to medical treat-



ment in these cases, because it must be apparent that they are to be relieved principally, and almost solely, by mechanical aid. It will be obvious, however, that at the same time all means calculated to improve the tone of the system, and increase its force, must assist the object in view; hence, due attention to the condition and regularity of all the discharges of the body, daily exercise,—always so limited as to be short of fatigue,—riding in the open air, etc.; together with tonics, either of a vegetable or metallic kind, according to the condition of the frame, must be useful, and facilitate the desired improvement of form.

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## CHAPTER V.

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### CONSECUTIVE ADVENTITIOUS, OR ORDINARY LATERAL CURVATURE.

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*General Remarks.*—NATURE OF CONSECUTIVE CURVATURE—THE SPINE IS USUALLY DIRECTED TO ONE SIDE—CAUSE OF THIS—THEORIES OF BICHAT, CHESELDEN, SERRES, CRUVEILHIER, AND OTHERS—EXCEPTIONS AND COMPLICATIONS—LATERAL CURVATURE MOST COMMON IN FEMALES—SUPERVENES DURING THE GROWTH OF THE BODY—IS ACCELERATED BY ACUTE DISEASE—MENORRHAGIA—LEUCORRHOEA, ETC.—CEASES TO PROGRESS ON THE ATTAINMENT OF PUBERTY.

*Mode of Invasion.*—DISPARITY IN THE HEIGHT OF THE SHOULDERS—APPARENT INEQUALITY IN THE SIZE OF THE SCAPULÆ—SIMILAR DECEPTION OBSERVED IN THE DEVELOPMENT OF THE MAMMÆ—EFFECT OF A LUMBAR CURVE ON THE PELVIS—ROTATION OF THE SPINE—ORDER IN WHICH THE CURVES OCCUR—IMPORTANCE OF PROPER MEASUREMENT—DEFORMITY OF THE THORAX—SPONTANEOUS RECOVERY RARE—DIAGNOSIS OF TEMPORARY AND PERMANENT CURVATURE, ETC.

*Constitutional Phenomena.*—SYMPTOMS DETAILED—CASE OF M. A., SHEWING OCCASIONAL RAPIDITY OF PROGRESS, ETC.

*Pathology.*—EFFECTS ON THE INTERVERTEBRAL FIBRO-CARTILAGES—ON THE VERTEBRÆ—ON THE CONNECTING LIGAMENTS—ON THE SPINAL MUSCLES—OPINIONS OF VARIOUS AUTHORITIES—PREDISPOSING CAUSES FURTHER CONSIDERED—EFFECTS OF TIGHT LACING, ETC.

*Treatment.*—PRINCIPLES OF CURE—REMOVAL OF CAUSES—SPECIAL EXERCISES—TENIEL'S SPRING ROD—VULCANIZED GUM ELASTIC STRAP—ORTHOPÆDIC MACHINES—ORDINARY PASTIMES—MECHANICAL MEANS—DWARF CRUTCHES—STEEL SUPPORTS—BIGG'S ORTHOSPINALIS—TAVERNIER'S LEVER BELT—SHAW'S PLANE—VERRAL'S COUCH—GUERIN'S OPERATION—DIVISION OF FASCIA LUMBORUM.

HITHERTO we have presumed the party affected to be of sound constitution—not in any way pre-disposed to spinal irregularity—and in the enjoyment of good health. Under such circumstances the vital and physical powers may be regarded as capable of opposing to the utmost the invasion and progress of the affection; hence the spine may be said to yield to the *direct* influence of the exciting agents. We are next to investigate the more aggravated form of adventitious curvature, produced by the *indirect* operation of the causes whence it proceeds, and primarily dependent on constitutional debility. To distinguish the de-

formity when thus complicated, I have proposed the epithet *consecutive*. My reasons for selecting this term will become more apparent as the history of the affection proceeds.

In curvatures so produced, the vertebral column generally inclines to one side of the body, most frequently bulging towards the right side in the interscapular, and to the left in the lumbar region; and these are the inflexions especially indicated when the term *lateral* is employed in works descriptive of spinal deformity.

Various theories have been proposed to account for the order or arrangement of the interscapular and lumbar deviations just noticed. Some physiologists have attributed it to the more frequent and energetic use of the right arm and corresponding side of the trunk, in the performance of the usual occupations of life; the weight of the body being at the same time thrown on the right ilium, whilst the muscles of the opposite side of the spine are called into a somewhat more than corresponding degree of action, to enable the individual to preserve the equilibrium of the body. Others have conjectured that the natural inflexions of the vertebral column, which in every individual, in accordance with perfect symmetry, incline in a trifling degree in the directions above indicated, may lay the germ of the morbid bias. Bichat as-

cribed this *natural* lateral inclination of the spine to the predominant action and greater development of the right arm. Cheselden believed the upper inclination to be an arrangement rendered necessary by the position of the heart. Serres entertained a similar opinion, and further pointed out the intimate relation that exists between the position of the thoracic and abdominal viscera, generally, and the normal direction of the spine. The constant pulsation of the arch of the aorta, it has been supposed, might contribute to determine the natural inflexions of the column;—a theory not a little supported by the fact that in cases of transposition of the viscera, the natural inclination and curvature subsequently formed upon it have been directed towards the *left* side: two cases of this description are related by Grisolles. Cruveilhier is inclined to the opinion that the natural inclination of the spinal column alluded to, is but a particular instance of the general law, that bones present a depression wherever a large artery is in their immediate vicinity. It has also been observed as a curious coincidence, “that in preternatural lateral deviations of the spine, the heart and the liver, in the great majority of cases, correspond to the concavities of the primary and secondary curvatures,



which must to a certain extent prevent their functions being disturbed.”\*

Strictly speaking, however, it very rarely happens that the curvature is simply to one side. If not at an early period of its formation, it nearly always happens at an advanced stage, that the natural direction backwards in the interscapular region is also somewhat increased; so that the deformity may be said to be a combination of undue dorsal excurvation and lateral inclination. In the loins likewise the same kind of double direction may be observed, the natural lumbar inflexion being in a slight degree augmented, while the vertebræ swerve laterally. As these compound irregularities advance, the spine at the same time becomes somewhat rotated on its axis, so that the anterior centre of the bodies of the lumbar vertebræ is directed diagonally across the pelvis, in a line extending to a perpendicular raised on the anterior and superior spinous process of the ilium of one side; while the corresponding central point of the vertebræ, in the dorsal region, is directed more or less obliquely to the nipple of the mamma on the opposite side.† These complications not only

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\* *British and Foreign Medical Review*, vol. xii, p. 342.

† These complications are well marked in figs. 1 and 2, p. 93, also, in the skeleton forming the frontispiece of the present

aggravate the visible symptoms, and often obscure the real nature of the affection, but render its successful treatment a matter of extreme difficulty, and, at an advanced stage, altogether hopeless. Neither is it necessary, perhaps, to observe, that deformity, thus complicated and engendered by a chain of operations so circuitous, is liable to develop its early stage in a very insidious manner,—so much so, indeed, that considerable advance is often made before the attention either of the patient or of others is directed to its existence.

It must be further evident that as the deformity itself advances, it may, in turn, rouse into activity certain morbid conditions of the system, which might otherwise have remained dormant; or, by impeding the healthy performance of the vital and natural functions of the body, it may undermine the general health, and thus prove, indirectly, very efficient in its own aggravation. In this manner a nervously-disposed girl, subjected to a train of morbid influences, is liable to become the subject of hysteria; and this, in turn, may not only

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volume; for permission to make an engraving of which I am indebted to the liberality of the Treasurer of St. Thomas's Hospital,—on the floor of the Museum of which Institution the original may be seen. The reader is also requested to turn to the anterior view of the same skeleton, Chapter VII.—(Steel engraving.)

accelerate the advance of the spinal inclination, but itself suffer augmentation *reflectively*—if the expression be allowable—in consequence of the impediment offered, as the physical derangement proceeds, to the due performance of the functions essential to life, namely, those of the heart, lungs, etc. The mental inquietude, depression, and irritability of the nervous system, emanating from a consciousness of physical infirmity, when curvature has already made some advance, may also, in some cases, operate as a source of moral enervation, calculated to exert no inconsiderable influence on the constitution. Let us not forget that the brightest hopes, the most brilliant prospects, the happiest career, may be completely blighted by the supervention of deformity, and the unfortunate victim be doomed to pass her days in unprofitable seclusion.

It will be observed, that *lateral* curvature is here described as it occurs in young women. In fact, this infirmity, unless under the circumstances detailed in the last chapter, very rarely presents itself in the opposite sex, independently of specific constitutional predisposition. When an exception to the general rule does happen, the affection seldom exists in a sufficiently marked degree to become an object of professional treatment. The reason of the difference in this respect between the two sexes will

become obvious in the sequel. Lateral curvature of the spine may, however, as has already been explained, be frequently seen in factory children of *both* sexes, and is by no means uncommon in the young inmates of workhouses; more especially such as are brought up to the sedentary employments of the tailor and the shoemaker: occupations not unfrequently carried on in ill-ventilated apartments, the children being often at the same time but imperfectly fed.

Occurring under ordinary circumstances, lateral curvature is a deformity that almost universally supervenes during the growth of the body, and, at what may be called the transition period of life; seldom declaring itself before the ninth or tenth year,—most usually between the twelfth and thirteenth. When the spine yields much earlier than at the period first stated, we may expect to find that the child is hereditarily predisposed, and that some other indication of a rachitic diathesis is apparent. But if the spine retain its natural symmetry till the completion of the ninth or tenth year, and no indications of rickets manifest themselves in other parts of the body, we have sufficient grounds, in most cases, for concluding that, although the constitution may be feeble and delicate, still there exists no very decided *specific* predisposition to deformity.

When weakness of the spine does not manifest itself until after the trials and ordinary diseases of childhood are past,—that is, not before the attainment of the fourteenth or fifteenth year,—the predisposing causes in young women are, in many instances, connected with that debility of the vital and natural powers frequently attendant on the establishment of the functions of the uterine system. The animal frame at this period of life is extremely subject to impression, and susceptible of the pernicious influences which operate as active causes of spinal curvature, and to which young females of a certain rank in life are then in a more especial manner exposed. When not referable to these circumstances, we may often trace the commencement of the deformity to a temporary general feebleness of the body, succeeding, perhaps, to an attack of some acute febrile disorder; such as typhus, scarlatina, small-pox, measles, or hooping-cough. Recovery from these diseases, when they occur during the transition to puberty, is occasionally very protracted; and, should any of them supervene during the formation of lateral curvature, the future progress of the evil is liable to be thereby materially accelerated.

When the spinal column does not yield until after the fourteenth or sixteenth year, we may perhaps find that the predisposing cause is a general debility



of the system arising from menorrhagia, or profuse leucorrhœa. It may also be questioned whether indulgence in certain vicious habits, by no means uncommon at this period of life, may not, in some instances, so enervate the frame, as to prove very instrumental in favouring deformity. I have seen cases which there was great reason to believe proceeded mainly from this cause, in which the progress was so rapid, that I could not help suspecting the elaboration of phosphate of lime to be either partially or totally suspended, so that the spine yielded more readily than it otherwise would have done.

During the early stages of lateral curvature, the progress of the inclination is in general slow, and almost imperceptible ; it may, indeed, continue for months so inconsiderable as to escape detection. When first discovered, it is often for a length of time regarded as a defect of trivial importance, and no efficient preventive means are adopted. This circumstance is much to be regretted, because, at an early period the further extension of the evil can, with tolerable certainty, be obviated ; while on the other hand, as soon as the curvature has made some little advance, it becomes an active agent in its own increase, independently of the causes that originally produced it. The subsequent advance of the deformity is, therefore, more rapid ; the ratio of increase generally being in proportion to the

length of time it has existed. This law, at least, holds good up to the complete attainment of puberty, when a more vigorous state of the system is usually established, which arrests the further progress of the deformity, by strengthening the various parts of the spinal apparatus. At the same time, it may be observed that the completion of the changes attendant on this period, the consequent full development of the animal frame, and the ultimate solidification of the osseous system, are much retarded in persons who become the victims of deformity; whether the predisposition to the infirmity be hereditary, or of secondary induction.

*Mode of invasion.*—Among the earliest indications which in general attract notice, is a disparity in the height of the acromion processes of the scapulæ, coupled with an apparent irregularity in the growth of the bodies of these bones. One shoulder appears to be larger, and is higher than the other. The inferior angle of one scapula, (which, in the delineation that heads this chapter, is that of the right side), projects considerably, and is, at the same time, further removed from the true centre of the back than it ought to be. A casual observer imagines this portion of the bone to be enlarged, and in popular language the shoulder is said to be “growing out”, while the

opposite scapula appears smaller and more depressed than natural. The reverse of these states obtains with regard to the mammæ; the one on the same side as the displaced shoulder-bone appearing to be absorbed, flattened and diminished in size, and sunk in the chest; the other, on the contrary, being prominent, and to all appearance actually enlarged.\* But this disparity in the apparent development of the mammæ is subject to considerable variety, and is by no means constant in a proportion equal to the degree of deformity in other respects, as it depends not only on the altered axes of the ribs, but also on the degree in which these bones are themselves deformed, as well as on the particular ribs that may happen to be affected. When the curve is seated low in the back, and the inferior ribs are those especially displaced by it, the disparity in the size of the mammæ is often slight. This inequality in the size of the mammæ will also depend considerably on the degree to which the vertebral column may be rotated on its axis: a circumstance that will be presently more fully explained.

It need scarcely be observed that the dispro-

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\* "When the deformity is not noticed till about the fifteenth year, the state of the breasts most frequently first attracts attention, one appearing larger than the other, and growing so unequally as to lead to a suspicion that it is diseased."— *Shaw*.

portion in the *size* of the scapulæ *is not real*, but only apparent, and arises from the unnatural situation these bones occupy in consequence of the altered relations of the ribs over which they lie. This inequality is most remarkable when the fifth, sixth, and seventh dorsal vertebræ form the centre of the curvature; because the inferior portion of each scapula lies upon the angles of the ribs connected with these bones. The difference in the *height* of the acromion processes, however, on the contrary, is not fictitious but *positive*; that acromion being the highest which belongs to the scapula lying over the convex aspect of the dorsal curve. The height is greater when the third and fourth dorsal vertebræ form the centre of the spinal deviation.

This law in reference to the disparity in the height of the acromia is by no means universal. Thus for example, if, in a case of double curvature the deviation in the lumbar region has been that first formed, each shoulder may be alternately the highest. As the inequality, however, at an early period of the evil, is very slight, and only to be detected by undressing the patient, and carefully measuring the distances, it for the most part escapes observation.\*

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\* The reader is referred to the wood-cut illustrative of ra-

Some maintain that the lower curve is in general that first formed, a question which will be discussed presently. Supposing, however, the contrary to be the case, a counteracting deviation would be established in the lumbar region, long before the misfortune had attained a marked extent. Perhaps even a third, or upper curve, might be detected in the course of the cervical vertebræ, since, as the infirmity advances, a somewhat counterpoising power is also exerted by the muscles attached to this portion of the column. In this manner the spine, when traced by the finger, presents, at last, a serpentine line inclining to each side alternately.

The curve in the lumbar region always deranges the axis of the pelvis; hence we find the hip on one side much larger in appearance, and more elevated than that of the opposite; a reverse order in this respect being in general observed to that which obtains in the projection and displacement of the scapulæ. On one side, the lumbar region

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chitic lateral curvature, complicated with collapse of the left side of the thorax, in the case of the boy, E. T., fig. B, Chap. VII, for an example of an opposite condition of the acromion processes; that of the left shoulder being considerably the higher of the two, in consequence of the degree in which the spine is curved in the lumbar region, and the manner in which the patient is obliged to recover his centre of gravity to prevent himself from falling.



falls in, while on the other it is full and convex, corresponding with the outline of the deformity. The fulness is also rendered much greater in consequence of the transverse processes projecting in in an unusual degree to one side, while they sink in on the other. This appearance of fulness, combined with the firmness it imparts to the bulging muscular texture lying over the processes, is apt to impress the surgeon with the belief that the muscles in the lumbar region on the convexity of the deformed part, are hypertrophied ; \* but such is not in reality the fact. The same want of symmetrical proportion will be found to exist in the cervical region when this portion of the spine is curved.

In the formation of the lumbar curve, it occasionally happens that the last two vertebræ are not involved ; and, in such cases, provided there be no difference in the length of the inferior extremities, the axis of the pelvis may retain its natural correctness. On the other hand, a double curve often exists in this region—the upper one being very apparent, and the lower, with difficulty discernible ; the result is that the side of the pelvis we should naturally expect to find the most elevated, looking to the curve

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\* This was the theory of Heidenrich.

that especially attracts notice, is, on the contrary, the lowest. A knowledge of this fact is of considerable importance; otherwise we may fall into the error of treating the curvature as if it proceeded from a difference in the length of the legs, when in reality it arises from a vitiated condition of the axis of the pelvis. It may here be remarked that, although the axis of the pelvis is frequently deranged in ordinary lateral curvature, the bones themselves very rarely become altered in shape. When any deformity occurs in the pelvic bones, the case is, in all likelihood, complicated with some degree of rachitic softening of other parts of the osseous system, in which case the ribs will in all probability be deformed likewise.

The order in which the several curves form, has given rise to much controversy. The question, though apparently one of trivial import, is, in reality, of moment, inasmuch as our diagnosis, prognosis, and mode of cure, are often materially influenced by attending to this circumstance.

Those who maintain that the spine, in lateral curvature, always yields first in the *lumbar* region, refer to the circumstance that the column has here to sustain a greater weight and stress than in any other portion of its length; while, at the same time, it is deprived of the support afforded by the numerous ligamentous and muscular attachments by

which the dorsal portion is connected with the ribs. Presuming that the vertebral column is subject to the same laws as any non-vital, flexible body of similar mechanical structure, these physiologists conclude, that, if it be equally weakened throughout its whole length, it will first yield near, or a little below, its middle. But they overlook the pyramidal form of the spine, and other peculiarities of its construction; hence their reasoning is, to a certain extent, inapplicable, and their conclusions erroneous.

Other physiologists, on the contrary, insist that the *dorsal* curve is that first formed.

It appears to me that, in the greater number of examples, curvature first occurs in the lumbar region, because in its early stages it usually proceeds more from position and gravity than from an enfeebled state of the muscular and ligamentous systems. The deviation of the column that next succeeds, is probably dependent on the muscular efforts made to preserve the equilibrium of the trunk on the pelvis.

When curvature is in any way connected with a disparity in the length of the lower limbs, lameness of any kind, a habit of standing on one leg, or any agent of similar description, the vertebræ, for the most part, yield first in the lumbar portion of the spine, because the lower part of the column

is nearest to the pelvis, the axis of which, in such case, suffers derangement before the spine is affected. During its early stages, lumbar curvature being somewhat difficult of detection, a deviation in the interscapular region is nearly always formed before that in the loins is even suspected to exist.

The spinal column, however, may not only incline to one or other side, but it may likewise be somewhat *twisted*, or rotated on its own axis.

So much did this circumstance attract the notice of Dr. Dod, that he considered it to be the primary evil, and that to which all the other phenomena may be traced. So strong, indeed, was his conviction in this respect, that his work on lateral curvature is entitled "Pathological Observations on the *Rotated*, or Contorted Spine." My own experience leads me to coincide with Dr. Dod in considering that sufficient attention has not been paid to this rotation as regards its influence in altering the axis of the ribs. I am also satisfied that, in many instances, *rotation* is the *first* in the series of morbid changes, and that, in all cases it exists, in a slight degree, even from a very early period of the disorder. The apparent disproportion in the growth of the mammæ is in a great measure owing to this circumstance, although it is very much increased when the ribs themselves are deformed

and fall in on one side, so as to destroy the natural contour of the chest.

The twisting of the spinal axis, at first probably one of the consequences of enfeeblement of the muscular and ligamentous structures, is aggravated as the deformity advances, by the counteracting effort made by the individual to preserve the balance of the trunk, when once the centre of gravity is lost. Thus, while the angles of the ribs of the right side are projected backwards beyond the due level, the opposite ilium is advanced in a corresponding degree to counter-balance the faulty equilibrium which would be otherwise produced. It is by a similar train of counterpoising exertions, when the equilibrium of the two sides of the body is destroyed by the formation of one curvature, that the spine yields above, or below, according to the site of the deviation, in order to restore the centre of gravity by the establishment of another. The semi-rotation of the spine contributes very much to the *degree* of the deformity. It rarely takes place, however, in an extreme manner, except in those more formidable cases which seem to be connected with an unusual degree of general constitutional debility, or, perhaps, with a rachitic state of the bones in general.

That a slight rotation of the spine on its own axis, is frequently one of the earliest in the series of

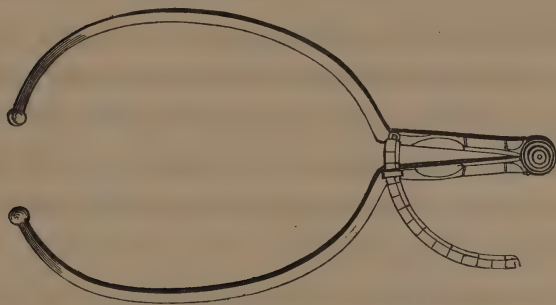


abnormal changes, I am disposed to presume from the fact, that it is not uncommon to meet with projection of the inferior angle of the scapula, even to a considerable extent, before the perpendicularity of the spine itself is visibly disturbed; a circumstance that can only be explained by supposing some degree of rotation to be first established in the column, which deranges the proper direction of the ribs, and causes their angles to project in an unnatural manner.

As the deformity advances, the patient's manner of walking becomes shuffling and awkward; her clothes cannot be made to sit well; her dress is with difficulty retained on the elevated shoulder, which from the feeling of discomfort occasioned by its exposure, is constantly hitched up for the purpose of keeping it covered. The sash encircling her waist cannot be made to retain its proper position, but is observed to dip to one side; so that the whole trunk, viewed from behind, presents a twisted, distorted appearance, the clothes being all drawn towards one side of the body.

The best mode of displaying the altered direction of the column, is to rub the line formed by the projection of the spinous processes pretty smartly with the knuckles, till the surface of the skin is reddened, after which, the degree of devi-

ation may be easily estimated by applying a plumb-line dropped from the centre of the poll. The extent of deformity in other respects may be ascertained by measurement made with a piece of tape or cord ; or still more accurately, and with greater facility, by means of a graduated instrument similar to that used by phrenologists for measuring the dimensions of the head ; but of larger size, such as here represented.



*See in the text*

This instrument enables us to take the exact measurement in the *direct* line of any diameter ; or from given points of the spine, sternum, and pelvis, to the acromia, and most distant parts of the ribs ; and affords, at the same time, a register of the various abnormal proportions, seldom ascertained with the necessary degree of minuteness by other means ; so that we can with certainty

estimate any improvement, or aggravation, which may take place during the treatment.

Long before the vertebral column has attained any great degree of obliquity, the axes of the ribs become more or less altered. In proportion as the column is twisted on its base, so are the angles of the ribs displaced, and rendered acute. Sometimes, indeed, they project directly backwards to such a degree, that, unless the examination be conducted with caution, they are liable to be mistaken for the spinous processes of the vertebræ. The chest becomes flattened, and its antero-posterior diameter shortened; while its lateral diameter is widened, though in a diagonal direction. In severe cases, indeed, the thorax is, as it were, so twisted on the spine, that the sternum is carried obliquely to one side.

So long as the arrangement and form of the ribs are merely such as must necessarily result from their connexion with the displaced vertebræ, the deformity may be considered as *simple* in its nature,—that is, independent of any *specific* constitutional influence capable of producing a subversion of the natural proportions of the chemical constituents of the bones; but when the shafts of the ribs themselves become misshapen by the action of the muscles attached to them, or from pressure, there is reason to conclude that some

predisposing influence of a constitutional kind is in operation, by which the bones are either being denied their natural supply of phosphate of lime, or becoming soft in consequence of the removal of their earthy base by absorption. It need scarcely be remarked that the observer must be on his guard against the fallacy of presuming that the ribs are always misshapen when their direction is perverted, as this happens more or less in every case of simple curvature.

When once a morbid bias is imparted to the vertebral column, we shall be deceived if we rely on the spontaneous efforts of nature for its removal. Such an occurrence is very rare. The longer it exists, the worse and more conspicuous in general will it become, within certain limits, unless we remove the girl from the influences whence it proceeds, and insist on a more judicious course of physical discipline.\*

Under the impression, however, that time will remedy the evil, and often from motives of false delicacy and feeling, artificial means to cover the deformity are had recourse to, and faith is placed in the devices of the dress and the corset maker,

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\* It will, in fact, progress till the young person attains that period of life when the frame-work of the body usually acquires firmness sufficient to resist the influences to which she is exposed.

until the misfortune finally advances so far that these resources no longer conceal it. Were a surgeon consulted at an early period, it is probable that such artifices would never become requisite, and much vexation, and subsequent ill-health, might be prevented. During childhood, back-boards, steel-stays, forced positions of the body, concealed pressure,\* and similar expedients, are often resorted to, with a view to force in, or bind down, the *projecting shoulder-blade*, erroneously supposed to be the only circumstance deserving attention; and which, as has been shewn, is one of the first and most apparent consequences of the curvature, or of the rotation of the spine on its axis. It need hardly be observed, that this treatment almost invariably aggravates the mischief it is designed to remedy, and injures the shape of the chest; since, it is only at the expense of the just configuration of this important part of the frame, that such means can exert even an apparent influence in mitigating the deformity. At a later period of life, the measures pursued, being found ineffectual in restraining the progress of the affection, are abandoned. Such distortions, in a moderate degree, being observed to be by no

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\* It is customary to bind over the projecting shoulder-blade a plate of lead, which is concealed under the dress.



means uncommon, like other evils of frequent occurrence, are considered to be of comparatively small importance ; particularly as they neither threaten existence, nor incapacitate the person for the fulfilment of the ordinary duties of life.

Curvature in its earliest stages, as already stated, usually advances by slow and imperceptible degrees ; but after it has attained some extent, its progress is more rapid. Now, although this circumstance is chiefly attributable to the constitutional and physical resistance being more efficient in the early stages, before the health of the individual has suffered in any considerable degree, still it may be partly explained on a very simple principle of physics, which the spine, though possessed of vital powers, to a certain extent obeys.

So long as a column is perpendicular, it will sustain a weight under which it would certainly sink were its perpendicularity in the least degree disturbed. In like manner, the spine, so long as its natural direction is preserved, is able to resist the weight of the upper parts of the body, under which it rapidly yields, when, from any cause, curvature is produced.

We have already observed that acute febrile disease, and the profuse discharge of natural secretions may lay the groundwork of protracted general debility, highly favourable to the production of

curvature of the spine ; and also, that exhaustion of the physical and constitutional powers, from other causes, may give rise to the same results. On this last source of curvature a few additional remarks may not be inappropriate.

When children are improperly fed, or not allowed enough food, or denied sufficient exercise in the open air for the conservation of health ; or are subjected to too close and continued application to study, as frequently happens during the last two years of scholastic tuition, when the grand effort is made to finish the education, and the parent is desirous that the child should acquire as many accomplishments as possible within a limited time ; the injury inflicted on the physical powers is often incalculable. The evil is, in many instances, increased from the circumstance, that the young person is at the same time obliged to maintain an irksome position during the hours of study, while her back is left unsupported ; as the muscles are thereby kept in action until a degree of exhaustion is produced, highly injurious to the constitution, and calculated to materially aid in the establishment of spinal curvature.

When the exciting causes operate very actively, the child may be speedily thrown into such evident ill-health, that the attention of the parent is early drawn to her condition, advice is sought, and she

is saved from the evils to which she was exposed. If, on the contrary, the impression be made on the system by slow and insensible degrees, the child perhaps never becomes so unwell as to excite alarm ; but is considered to be weakly and delicate, or hysterical. If arrived at the age of thirteen or fourteen years, this condition is not unfrequently attributed to the efforts made by nature to establish those changes in the constitution which usually take place at this period of life ; she continues, therefore, exposed to the influence of the causes that have induced this state, and to a certainty becomes the victim of deformity.

At an early period of curvature, as the defect is apparently of only trifling importance, parents are too apt to be wilfully blind to its existence ; or are unwilling to acknowledge that their child is crooked. They flatter themselves that, as she advances in years and stature, the spine will regain its pristine form, and are encouraged in this impression by the every-day remarks of friends who, like themselves, are ignorant of the changes which are being insidiously established. Time rolls on, and the curvature steadily increases, till it is so far advanced and confirmed as to become irremediable.

For a length of time after its commencement, the

curvature is single, of trifling extent, and can be removed at will, either by a muscular effort to straighten the column, by a change of position, or by means of gentle mechanical extension of the body. It disappears, for example, when the young person lies on her back and stretches herself, or flexes the body forwards over a fulcrum or support; but it recurs on her resuming the upright posture.

So long as the column can be restored to its proper form by the unaided muscular efforts of the individual, the terms *incipient* and *temporary* are appropriate, as distinctive of the stage and state of the deformity.

When the spine can no longer be rendered entirely straight by any of the means above indicated, the curvature is established; and is then said to have become *permanent*.

*Constitutional phenomena.*—Having laid before the reader a general outline of the physical peculiarities which ordinarily characterize the development of lateral curvature, without embarrassing the subject by a detail of general symptoms, I shall now proceed to consider that deformity in connection with certain constitutional phenomena that demand the utmost attention on the part of the professional adviser.

From what has already been said, it will be

apparent that, in this kind of curvature, the causes whence it originates, are, for the most part, inadequate to produce their effects upon the vertebral column, until the general powers of the system have become enfeebled.

Certain indications of impaired health may generally be observed, such as diminution or loss of the roseate hue in the naturally ruddy girl; the cheeks presenting, instead, a waxen, dough-like, or anæmial appearance. The integument becomes lax, soft, and hanging, and the skin presents a dirty or dingy surface. The girl seems listless and languid; there is a heaviness about her eyes; she is evidently out of health, debilitated, and unable to endure the degree of fatigue natural to one of her years. Her temper becomes peevish; her appetite is diminished; her digestion is impaired; she is troubled with flatulence, globus hystericus, pain in the left hypochondrium, constipation, cold extremities, and other marks of an insufficient circulation. When more than ordinarily fatigued, febricula, hectic flush, nervous irritability, convulsive twitchings of the extremities, hurried breathing, palpitation of the heart, pain in some part of the back, and various symptoms of hysteria, are liable to supervene; and in the course of time, not only is her whole frame greatly debilitated, but the groundwork may be laid of much subsequent



vexation, suffering, and ill health, especially from chlorosis or dismenorrhœa. When, moreover, from hereditary predisposition, or other causes, there exists a tendency to consumption, we should bear in mind, that the influences which prove most efficient in favouring the formation of curvature of the spine, are equally calculated to raise into activity tubercles, which might possibly remain for years in a quiescent state ; or, perhaps, never



Fig. 1.

develope themselves at all, under a different and more judicious system of physical discipline.

When the constitutional powers are much undermined, deformity sometimes proceeds with a degree of rapidity almost incredible; such was the case in the following example.

The young person (M. A.), from whom the annexed delineation (fig. 1) was taken, by means of a *camera lucida*, had attained her eighteenth year, free from all deformity. She then came to London, from a village in Norfolk, in perfect health. Within the space of two years her distortion attained its present frightful and distressing extent. She was articled to a dressmaker, and afterwards had no time either for recreation, or the exercise essential to the conservation of her health. Her diet when in the metropolis, it may be presumed, was very different from what she had been accustomed to at home; and the air she daily respired in a small room crowded with workwomen, combined with much unhappiness and misery, all conspired to enfeeble her general health. Her spine in consequence yielded, and the mischief gradually proceeded, involving the ribs, but not the pelvis, till she unfortunately became the distressing object she now presents. Fig. 2, next page, affords a front view of the same case.



Fig. 2.

Although the foregoing general description of lateral curvature may be said to apply to more than nineteen cases out of twenty, it must still be acknowledged that examples do occasionally present themselves, in which we are unable to detect the influence of any of the circumstances we have mentioned. The system of discipline may have been most judicious in every respect ; the patients

may have breathed the purest air, been well fed, and allowed the full, unconstrained use of their limbs. Hence we are led to the conclusion, that there may exist in certain individuals a natural tendency to the affection, which does not indicate its presence by very easily recognized evidences.

*Pathology of ordinary lateral curvature.*—Although, in the course of the foregoing history of the physical peculiarities of ordinary lateral curvature, several remarks have been made tending to explain the nature of the proximate cause of the affection, there still remain to be noticed many circumstances connected with this part of our inquiry. Presuming my readers to be sufficiently acquainted with the healthy characters of the spinal column, I shall now proceed to examine carefully the pathological changes which are successively produced, from the earliest invasion of lateral deformity.

The first change produced is simple condensation of the circumferences of the intervertebral fibro-cartilaginous substances, in consequence of unequal compression. This is speedily followed by actual absorption of their most compressed parts.

The bodies of the vertebræ, as is well known, are connected together by means of a strong, elastic, fibro-cartilaginous substance of considerable



thickness, which, while it prevents all appreciable movement of one bone of the spine upon another, permits considerable motion of the whole column of bones taken conjointly. To whatever side the body inclines, this substance yields in a slight degree, but readily regains its proper thickness on the spine resuming its natural perpendicularity; and this it may be said to do with a force proportioned to the health and vigour of the individual. As this elastic substance is continually subjected to pressure during the day, the vertebral column is somewhat longer in the morning than at night. In old age, the body is shorter than in youth, from the greater condensation of this substance; and the inclination of the spine forwards, in advanced life, depends upon the yielding of this structure to the superincumbent weight, when the muscular powers become too feeble to support the body in the erect position. Hence, any undue inclination to either side during life, if frequent, or constant, will give rise to a certain diminution in the thickness of this substance, on the side to which the body inclines, gradually followed by its partial absorption. The fibro-cartilages thus acquire a wedge-like form, which, in the course of time, will produce permanent distortion of the whole column of bones; and this vitiation in the figure of the intervertebral substances, proceeds with more ra-



pidity, in proportion as the curvature of the spine advances, and the edges of the deflecting vertebræ approximate each other. It is also more easily produced during early life, while the body is in a state of growth, the ligaments more yielding, and the intervertebral substance not so capable of resisting unequal pressure as it is at a later period,—that which supervenes from the attainment of maturity, to the decline of life.

In cases of ordinary lateral curvature it is not common for the vertebræ themselves to become misshapen; the pathological changes in this respect are generally limited to the intervertebral fibro-cartilages, the absorption of which usually proceeds to a much greater extent than in the simple adventitious form of the irregularity. On the *concave* aspect of the curvature, the intervertebral substances, being subjected to the greatest degree of compression, are frequently removed entirely by the absorbents, so that the margins of the bones with which they were connected are allowed to come into contact. In such case the surfaces of the vertebræ speedily unite with each other by ankylosis; and in this manner, for the most part, the further progress of the inclination of the column to one side is arrested; yet the amount of deformity that may be produced, without any alteration in the figure of the verte-

bræ themselves, is very considerable. When the exciting causes, however, act powerfully, and are long-continued in a young person whose constitution is, perhaps, naturally feeble, there is reason to believe that the osseous system in general undergoes some degree of softening, probably in consequence of the elimination of earthy base being deficient: the vertebræ themselves and the ribs, likewise, in such cases, are liable to become misshapen.\* At the same time I conceive it to be quite competent for a change to be effected in the form of the vertebræ, without any previous softening of their texture, in the same manner as the impressions of the arteries and tendons, coursing bones, are channelled out; or, as soft parts suffer absorption when compressed by a bandage. But this question will be further inquired into presently.

The articular and other connecting ligaments

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\* Mr. Shaw affirms, that the bones not only of the vertebral column, but of other parts, may become soft, simply from want of use. "If," says he, "a soldier in active service receive a wound, for which immediate amputation is necessary, or if the same operation be performed on a strong labourer while he is in full health and exercise, the bone is found hard as ivory, and compact in structure. But if either the soldier or the hospital patient be confined to bed for some time before the leg is amputated, the bone is found soft and spongy, like that of a scrofulous person."

being unequally, unduly, and permanently kept in a state of tension on the *convexity* of the deformity, experience, there is reason to believe, some impairment of tone, and finally become somewhat atrophied. It has, indeed, been maintained that, in some instances, these tissues may become so feeble and relaxed, and yield to the pressure from within to such an extent, as to admit of the vertebræ assuming relations with respect to each other akin to semi-luxation.\* Such a view, however, there can be little doubt, is erroneous. Were anything analogous to luxation liable to occur, we might expect to find, occasionally, some indications of compression of the medulla spinalis in lateral curvature; a circumstance which never happens unless there also exist some disease or destruction of the bones by ulceration. These cases, however, do not properly belong to the order of deformities under consideration. Neither could any displacement of the vertebræ very easily occur, without fracture of some of the processes by which they are connected together.

On the *concave* aspect of the curvature, the numerous tendinous digitations, by which the muscles of the spine are inserted into the vertebræ, and the ligamentous interlacements, by which the

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\* Harrison.

vertebræ and the ribs are tied to each other, insensibly shrink, and, as they do so, become permanently accommodated, by absorption, to the altered form of the parts they unite; so as in the course of time, to be rendered incapable of extension when an effort is made, either by the patient or by other means, to straighten the column.

The muscles, also, attached to the several vertebræ, on the concavity of the curve contract, and gradually accommodate themselves to the shortened distances in which they have to perform their functions. As the affection advances the muscles assume a state of permanent retraction, incapable of being overcome either by artificial force, or by the active contraction of the corresponding muscles of the opposite side;\* in some instances, it

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\* Illustrative of the extraordinary manner in which muscles can accommodate themselves to accidental circumstances, and of the great extent to which muscular fibre is capable of passively shortening itself, without any loss of its natural and healthy characters,—a case is detailed by the late Sir Everard Home, in the *Philosophical Transactions*, vol. lxxxv, page 210, in which the biceps lost six inches of its length by gradual shortening, while accommodating itself to the length of a broken humerus; the ends of the bone having been allowed gradually to overlap each other, so as to shorten the arm to that extent. The patient was so circumstanced at the time of the accident that he could not procure the assistance of a surgeon to set the bone.

would appear they suffer an actual diminution of their volume, from atrophy.

Some authors hold a contrary opinion, and maintain that the muscles, on the concave aspect of the curvature, are not only permanently shortened, but at the same time hypertrophied, from more constant use, and that thus they assist *actively* in augmenting the evil. In a work of very recent date,\* it is stated: "That lateral curvature is, *in almost all cases*, the result of an increase in the *vital energy*, and consequently in the *physical development* which the muscles of the *left spinal hollow*, and of the right shoulder, acquire from the habit early taught to children of making use much more frequently of the right than of the left hand."

We know that hypertrophy of certain of the dorsal muscles may be produced in a person enjoying full health, engaged in any daily labour that demands the more especial use of one side of the body; but it is not the state of these organs in the ordinary examples of lateral curvature of which we are here treating. The principal and earliest exciting cause in these cases, is the habitual observance of a position which gives rise to unequal pressure on the in-

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\* *Deformities of the Spine and Chest, successfully treated by exercise alone, and without extension, pressure, or division of muscles.* By Charles H. Harrison. London, 1842.



tervertebral fibro-cartilages; but this position is not, necessarily, one assumed by a voluntary, *active*, and *healthy effort* of the muscles, and alternated with full relaxation, so as to exercise these structures in a beneficial manner. On the contrary, it is usually one into which the body falls in consequence of fatigue, and which is more calculated to favour a morbid retraction than a healthy development of the muscles. To retain their full size and healthy proportions, the muscles of the back require to be equally and regularly exercised on both sides of the spine. If the flexor muscles of an extremity be kept *for a length of time* in a state of quiescence, by confining the limb in a semi-bent state, we do not find that they acquire power, or any increase of volume; on the contrary, they are liable to become atrophied; neither do we find that they admit of being at once fully extended again. We may presume, then, that the muscles of the back are similarly affected, when the movements of the vertebral column are confined by dress, or put under restraint by injudicious physical discipline.

It is not, however, to be inferred, because their power of healthy action is impaired, that the muscles lose their tone so completely as to be rendered incapable of taking any share in the aggravation of deformity. So long as they are not shortened to the utmost possible limit, we may presume

that they can contract when summoned by the will. But when the parts on which they act admit of no nearer approximation—as, for example, when the ribs are brought into contact, or imbricated—then all further contraction, either active or passive, must cease. And this I presume to be Mr. Stafford's view, as, in reference to the condition of the muscles on the concave aspect of the curvature, he observes:—"They must necessarily be contracted *without having any power of action.*" . . . . "They are rendered incapable of performing their proper functions."

Mr. Tilleard Ward informs us that, on dissection, he found the muscles on the concave side of the curvature "shorter and fuller" than natural; and Bichât states the same circumstance:\* "Dans les déviations diverses de l'épine les muscles suivent la disposition osseuse; ils s'allongent du côté de la convexité, se raccourcissent, et se renflent du côté de la concavité. Les faisceaux divers du transversaire épineux m'ont présenté surtout cette disposition." Mr. Shaw did not find that any very decided change was effected in the muscular tissue, but inclined to consider it somewhat atrophied; and, in allusion to the influence of inactivity on the muscles in general, he observes, that if these organs are not duly ex-

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\* *Anatomie Descriptive.*

exercised " they degenerate so as to lose their peculiar characters, and gradually become similar in structure to the common cellular membrane." Dr. Dod also asserts that the long-continued restraint of muscles in a state of contraction, is a main cause of their *disorganization*.

Dr. Gunther, of Hamburg, in an article he contributed to *Pfaff's Mittheilungen*, &c., heft. ix-x, 1836, informs us that in his dissections he found the muscles neither attenuated, shrunk, nor contracted, but of their normal size, and healthy in every respect—although, in some places, on the contracted side of the trunk, folded or plaited on themselves.\* In cases of severe deformity, Dr. Gunther conceives it possible for the muscles to gradually change their points of insertion, either by separating from one spot and becoming attached to another, or by forming a fresh origin by newly-developed heads, as happens in unreduced dislocations of long standing. This view of the subject, however, appears to me to be too hypothetical.

The conflicting opinions of the different patho-

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\* It is much to be suspected that the plaiting here described was the result of incautious dissection, and not a condition that existed during life; besides, it is at variance with the known laws observed by muscular fibres, which, as has been shewn, have a constant tendency to contract, and to adapt themselves to the state of the parts to which they are attached.

logists alluded to, probably depend on their observations having been limited exclusively to one particular stage of the deformity, that which it had attained when the *post-mortem* examination was made.

The aponeurotic expansion in the lumbar region of the *concave* side of the curvature has always appeared to me to be much thickened—perhaps more properly speaking, shrunken—and at the same time, dense and very unyielding; offering perhaps the greatest impediment of all to the restoration of the column to its natural line.

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On the *convex* outline of the deformity, as already stated, the different parts of the spinal apparatus are enfeebled, and perhaps in a slight degree attenuated, from being kept in a state of constant extension, unrelieved by alternations of full and healthy contraction. From this opinion no one, I believe, dissents. Jörg—and on his authority, Maisonnabe—maintains that the muscles on the convex side become lengthened and discoloured, and undergo a change of structure by which they approach in character ordinary cellular tissue. Mr. Shaw's and Mr. Ward's observations are to the same effect. Heidenrich believed the full appearance opposite the convexity of the curvature to be an indication of increased strength and development of the

muscles, and not to proceed from the altered configuration of the skeleton. There can be little doubt, however, that this opinion is erroneous; the fulness being—especially in marked cases—the consequence of rotation of the spine on its axis, by which the bodies and transverse processes of the vertebræ are brought under the fleshy masses of the lumbar muscles.\* Delpech tells us that all the muscles of the back are thin, pale, and weak; but he does not think that the muscles of one side are commonly more developed than those of the other.

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We are next to inquire into the changes effected on the *osseous* portion of the spinal apparatus.

It has already been stated, that in most cases of ordinary lateral curvature the vertebræ themselves do not experience any change of form. When, however, the constitutional powers are originally feeble; or when there exists any predisposition to deformity of the spine, either from hereditary causes, or in consequence of the vital powers having been seriously undermined by the influence of the more usual sources of this affec-

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\* Vide the position and direction of the transverse processes and bodies of the vertebræ in the lumbar portion of the spine represented in the skeleton forming the frontispiece of this work.



tion, there is reason to believe that the osseous system in general may be deprived of the full supply of earthy base. Under such circumstances, after the margins of the articular fibro-cartilages are so far absorbed as to admit of the bodies of the vertebræ resting unequally on each other, these bones are, in turn, acted on by the absorbents, and may, on the compressed side, be reduced to one-half their natural thickness. The bodies of the vertebræ are in this manner occasionally very much bevelled; the obliquity of their opposing surfaces may, indeed, be so considerable as to admit of the shafts of the ribs articulated to them overlapping each other. The deformity in such cases is very great; the pressure and friction of the imbricated edges of the ribs against each other cause them to be thinned by absorption, while the shafts of these bones are liable to become distorted by the action of the intercostal, and other muscles attached to them.

The growth of bone, there is reason to believe, bears a direct relation to the activity and vigour of the circulation of the blood within the bounds of health, so that whatever accelerates, while it supports the circulation without injuring the general health, promotes their consolidation. It follows, then, if this be true, that unless a due supply of blood be afforded to the bones of the

spine, they will be so much nearer to the state of cartilage than they ought to be; and will consequently yield more readily to the operation of any undue or partial pressure.

Now, it happens that many of the predisposing and exciting agents, to which such frequent allusion has already been made, are very efficient in preventing the free nourishment and consequent consolidation of the bones. The circulation, for example, is rendered languid and feeble from the want of proper exercise, and the influence of that mental exhilaration which arises from an innocent indulgence in natural feeling and the appropriate pastimes of early life. These are denied to the boarding-school Miss, and considered by the refined part of society as inconsistent with the strict moral discipline of young ladies, whose amusements are too often regulated by the formal notions of decorum entertained by the governess, and whose feelings are kept under a constant state of artificial and forced control.

This leads me to the consideration of the *modus operandi* of some of the more common causes of lateral curvature.

When muscles are not regularly and sufficiently exercised, they lose, in some degree, their capability of action. And, on the other hand,—

When their natural functions are unduly pro-

tracted, they become fatigued, and equally unfit for the performance of their destined duties.

Now, a careful consideration of these two laws of the animal economy will enable us, in a great measure, to explain the manner in which most of the causes, arising out of the circumstances of ordinary life, succeed in producing deformity.

The muscles ranged on each side of the vertebral column, are of different lengths, and subservient to different purposes. The special use of the short muscles, or those which pass between the several processes of the vertebræ, appears to be to keep the spine erect, by balancing its several portions on each other,—whilst the larger and longer muscles seem destined to act upon the column as a whole.

Now, among the circumstances calculated to interfere with the healthy exercise of the muscles of the spine, the restraints of female dress are not, perhaps, the least influential. A tight-fitting corset prevents a sufficient play of the muscles of the column generally, and supersedes almost entirely, at least during the day, the action of the short ones.

When the artificial support afforded by dress is removed, a woman accustomed to lace herself tightly instantly complains of weakness and inability to sit upright. “Persons adopting such

means," says an eminent French writer, "are sure to become distorted whenever the artificial props are removed."

The great philosopher Locke, who was also a physician, remarked the same fact. "Whalebone stays," he observes, "often make the chest narrow and the back crooked. The breath becomes foetid, and consumption probably follows."

Nor, when deformity is produced, does discontinuing the use of a corset remedy the evil, unless done with judgment and care, — means being adopted in the interim to prevent the spine from yielding farther, till the necessary tonicity of the muscles is regained by freedom and exercise.

It would be superfluous to do more than hint at the bad effects that may be produced on the organs of respiration in consequence of the confinement of the chest, and the deformity of the ribs that may be thus created in delicate rachitic girls, previous to the bones acquiring sufficient firmness to resist the influence of injudicious pressure. The impediments offered, also, to the proper motion of the stomach and bowels, and the consequent imperfect digestion of the food, cannot fail to lay the foundation of many distressing complaints, and not unfrequently, there is reason to believe, induce a premature decay in all the powers of life.

It is well known that many young ladies ac-

customed to lace tightly, are occasionally under the necessity of relaxing their stay-lace after dinner, in consequence of the uneasiness experienced during digestion. It is by no means uncommon for many of the symptoms of diseased heart to arise from the same source, which are speedily removed by a discontinuance of the practice.

The baneful influence of tight lacing, on the form of the lungs and liver, is familiar to every one who has had an opportunity of spending a winter in the dissecting-room.\* These organs are

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\* In explanation of an engraving illustrative of the effects of corsets on the form of the liver, Cruveilhier thus expresses himself:—

“ La figure montre un des effets des corsets sur le foie. La pression circulaire de ce vêtement s'exerçant essentiellement sur les dernières côtes, le foie est de tous les organes celui qui en reçoit l'influence la plus directe ; il est allongé de haut en bas, aplati d'avant en arrière, et déborde souvent de plusieurs travers de doigts la base du thorax. Une empreinte circulaire, plus ou moins marquée sur la face convexe du foie, empreinte produite par la circonférence inférieure du thorax, établit le lieu auquel répondait cette circonférence inférieure. A cette empreinte s'ajoute presque toujours une ligne ou zone blanche très prononcée, qui résulte de la transformation fibreuse des parties du foie comprimées. Cette transformation se fait non seulement aux dépens des membranes, mais encore aux dépens des granulations superficielles de l'organe.

“ Par l'effet de la pression circulaire du corset, le foie gagne en hauteur ce qu'il perd en largeur et en épaisseur, et il n'est



often found moulded into shapes the most distant from natural; conforming, in fact, to the artificial configuration gradually imparted to the chest and lower ribs, from the long continued pressure. How, then, can they be reasonably expected to perform in a proper manner their peculiar functions, essential as these are to the preservation of health?

I here introduce the trunk of a well-formed female skeleton by way of contrast to that of a person whose chest has become misshapen by the use of corsets.

Fig. 1 represents a healthy, well-developed thorax; Fig. 2, that of a chest rendered unnatural

pas rare de le voir atteindre par son grand lobe la fosse iliaque du côté droit, tandis que le moyen lobe déborde à peine le thorax.

“La partie du foie qui est restée à sa place accoutumée participe aux changements de forme qu’a subis la portion déplacée: elle soulève le diaphragme; en outre, sa partie supérieure est sillonnée d’une, de deux, de trois rainures plus ou moins profondes, qui résultent du plissement antéro-postérieur du diaphragme.

“Dans quelques cas, le corset étant fortement serré dans sa partie inférieure, le foie est refoulé entièrement en haut: son bord inférieur ayant seul supporté l’influence de la pression alors très considérable qui est exercée sur cet organe, a subi la transformation fibreuse; mais le foie lui-même a été refoulé en haut et atteint par sa convexité le niveau de la cinquième et même de la quatrième côte.” — *Cruveilhier's Quarto Work*, vol. ii. Livraison xxix, plate 4.

by tight lacing. The difference between these forms is too apparent to require comment: and that serious consequences are likely to be induced when the thorax is misshapen in the manner represented by Fig. 2, must be self-evident.

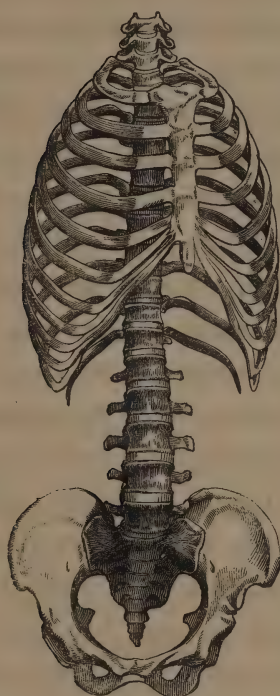


Fig. 1.

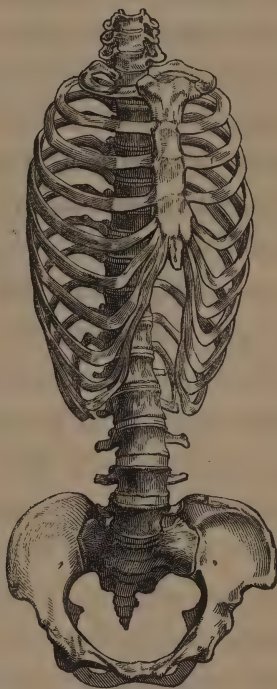


Fig. 2.

A woman habituated to the use of stays from an early age, and whose figure has suffered in consequence, finds it almost impossible to dispense with

them after she arrives at a certain period of life; but a young person unaccustomed from childhood to depend on mechanical support would never require such aid, provided her physical training in other respects were judicious and conducted on scientific principles.

The prevailing notion among females appears to be that corsets not only prevent, but have a tendency to remedy distortion of the back. The mechanical support they afford, and the artificial shape they impart, are alone taken into account in this opinion; the indirect and injurious effects they produce, by undermining the very foundations of natural vigour, are totally overlooked.

The consolidation of the vertebræ may also be much retarded in young women by the injudicious manner in which the general education is conducted. The perpetual moral restraint under which a girl is kept from the first dawn of intellect, and the inordinate calls made upon her mental as well as physical powers, rob her of that exercise to which nature prompts, and subdue or destroy her natural emotions. She is often stunted in her food, confined in her dress, and burdened with occupation. Her desire for action is curbed by customs which she may not transgress, by authorities which she dares not disobey, and at which she fears even to express

her dissatisfaction. A weak, and often a diseased heart—a languid circulation—a pale, pinched face, and cold extremities, with frequent chilblains—hysteria, and its Protean attendants—are the results, and indicate by what feeble powers the blood is circulated in the proverbially “puny boarding-school girl.” How, then, can a due deposition of earthy matter, on which the necessary firmness of the bones depends, go on as it ought under such a deprivation of the vital energy? This process demands a vigorous circulation; yet it would seem as if every possible means were taken to render the circulation weak. The bones of the spine, in young persons subjected to the discipline denounced, are very late in becoming firm, and in consequence yield easily to the superincumbent weight—aided, perhaps, by irregular action of the muscles, themselves more languid and feeble than they ought to be. The lassitude which necessarily, from these causes, pervades the general carriage of the child, forces her to acquire insensibly a habit of stooping, which, being attributed by the unconscious superintendent to indolence, is combated by enjoining a more rigorous attention to constraint. The girl is constantly reprimanded for not “sitting up.” This she cannot do, but in the effort contracts imperceptibly the habit of balancing the body on one



side, by which, while seemingly obeying the injunctions laid upon her, she eludes observation. A person seated upon a chair, or stool, may throw the weight of the head, trunk, and upper extremities upon either of the hips, almost without any apparent deviation of the spine from the perpendicular, by inclining the spine to one side, and leaning the head and neck slightly to the other. It is this position that proves so injurious to the child when engaged in drawing or writing, or when playing on the piano or harp. The right hand being used in all these occupations, causes the right shoulder to be raised; and, in order to facilitate this, the balance of the body is generally maintained on the corresponding hip; the effect of this position is to cause the interscapular portion of the spinal column to bulge out towards the right side.

The harp, perhaps the best calculated of any instrument to display to advantage an elegant form, is not on that account the less objectionable. The most usual mode of sitting, indeed, when performing on this instrument, is in a twisted position. Hence, young ladies should never commence learning the harp until the body is well grown, or has attained maturity of form, and the bones have acquired a corresponding degree of solidity.



*Treatment of Consecutive, or Ordinary Lateral Curvature.*

The principles on which lateral curvature is to be treated may be comprised under three heads:—

First.—The re-establishment of the impaired constitutional energies by hygienic and appropriate medical means.

Second.—The support of the vertebral column by mechanical aid, until the musculo-ligamentous apparatus has regained sufficient strength to render such assistance unnecessary.

Third.—The restoration of the physical powers by exercises of a general and special nature.

In pursuance of this plan, then, the first thing to be done is to remove the young person from the influence of the exciting causes, when practicable so to do; and if the spinal inflexion be but slight, to enjoin free and unconstrained exercise—in the country if possible—with perfect mental relaxation; or, at least, a very material diminution of study, if undue application of the mind appears to have been instrumental in the production of the evil. As a special exercise, the substitution of the left hand for the right, with due attention to position, may be enjoined;\* and in incipient cases,

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\* To familiarize young persons to use both hands indifferently

this, conjoined with the simple means now suggested, may suffice for effecting a cure. At a more advanced stage of curvature, when the general health has visibly suffered, it may be necessary to employ tonics, mineral-waters, sea-bathing, and other remedies; and also physical means of a special kind—such as were enumerated in the introductory remarks, or described in treating of simple adventitious curvature. In suggesting *special* exercises, the greatest attention should be given to their selection, as well as to the care with which they are afterwards practised. They should be used only for a short time on each occasion, and repeated at intervals daily. For the performance of the Spanish exercise (one of the calisthenic),



Teniel's spring rod.

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is very desirable. The ambidexter possesses many advantages in performing even the familiar operations of life; and nothing tends so much to preserve the symmetry of the spine as an equal use of both sides of the body.

the spring-rod, made of lacquered iron or brass, invented, I believe, by Mr. Teniel, is preferable to a simple wand.

The advantage of this contrivance is, that while it admits of the rod being elongated to any required length, a certain amount of muscular exertion is called forth to extend it; which, being repeated with the hands in different positions—for example, in front of the chest, above the head, behind the back, at either side—affords an easy and convenient plan of calling the muscles of the arm, of the shoulder-joints, and the interscapulars, into powerful action under a variety of circumstances. The strength of the spiral spring contained within the rod may vary from one to six pounds, or more, if required. For girls, from twelve to fourteen years of age, a spring of four pounds' power is generally sufficient.

For the same purpose, Mr. Cost, of Clapton, has lately proposed an elastic strap, constructed of vulcanized Indian rubber, covered with silk, and furnished with metal handles. This contrivance,—the form and uses of which may be gathered from the engravings on next page,—is more simple and, in many instances, preferable to the spring rod. It may be made of any strength, so as to offer a resistance, varying from one to six or more pounds' weight. Its principal advantage over the

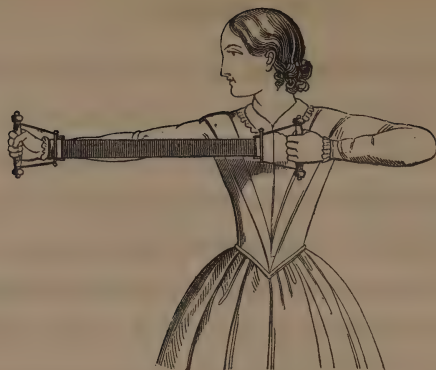


Fig. 1.



Fig. 2.

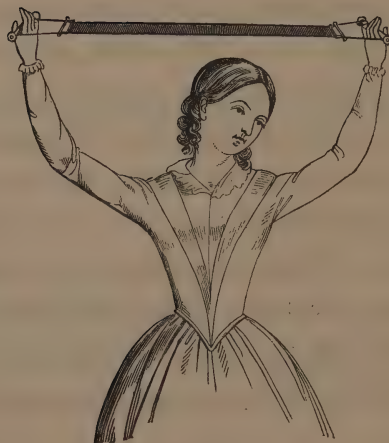


Fig. 3.

rod is the greater freedom and extent of motion it allows.

In some cases of distortion, the propriety of *special* exercises is very questionable, at least until, by means of extension and passive exercise, the spine has been somewhat restored to its natural direction. It may happen, in consequence of the degree of curvature, and the bias already imparted to the spine, that muscular action which in a less advanced state of the deformity would have been beneficial may, on the contrary, prove detrimental. When the bias imparted to the trunk is such that no unaided personal muscular effort can rectify it, the movements of the patient should be not only directed, but actually governed and constrained by another party. If the muscles be left to their own uncontrolled action, under such circumstances, every time they are called into play their action will contribute to increase the curvature. A person whose spine is much bent laterally is unable, without the aid of a bystander, to stoop down, or make a low bow, and to rise again in a line parallel with a perpendicular placed in front of the body, and dividing it at its natural medial line. In performing either the flexion or extension of the spine, the trunk will incline to the side to which the convexity of the curve is directed.

In certain cases of this description, it may be



desirable to exercise the patient in a supine, or in a prone position, and to do so by the aid of mechanical contrivances, as well as by personal direction and superintendence. For such a purpose, the sliding-plane, used by the late Mr. Shaw, and fitted up with appropriate exercising apparatus, or the French exercising orthopædic couch, may be recommended; at the same time I prefer more common and simple exercises, when they can be rendered available; and, above all, such an adaptation of ordinary pastimes and amusements, as may serve to convert them into special exercises; so that the mind may be interested while the body is being exercised.\* Supposing, however, that the

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\* The various orthopædic beds and other complicated apparatus for the purpose of obtaining special exercise, imported into this country from the continent, I believe to be of little use, inasmuch as they do not enable the patient to accomplish any movement calculated to restore the spine to its normal direction, that cannot be equally well, if not better, achieved by more simple, more attainable, and much less expensive means. To rectify deformity, it is necessary that the muscles should be exercised in a special manner; and to do this, the patient must be under the superintendence of a second party to guide his movements, and control them when they deviate, in consequence of the curvature, from the line of action desired; but this exercise should, as far as possible, be a voluntary effort on the part of the patient. Now, the orthopædic contrivances alluded to, though designed to obviate the necessity of such superintendence, unfortunately do not do so in the efficient manner their sanguine inventors expected. In an orthopædic establishment

health of the young person has not suffered so materially as to render a discontinuance of her studies necessary—or that, on other accounts, it is desirable that her education should proceed without interruption, it will be our duty to suggest some means of meeting the difficulty: and we may for this purpose recommend that the periods of application be short—not more than an hour or two at one time—and that the studies be varied, so as not to fatigue the attention by tedious application to the same task. After each lesson, the pupil should be allowed half an hour or more of recreation; if a child, the play should be heart-stirring, active, and uncontrolled,—the rougher the better, provided the actions be restrained within the

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these contrivances may prove very useful, when the exercises are conducted under the eye of an experienced person; but in private families such apparatus is not only inefficacious but often unattainable. Under no circumstances, however, ought mechanical means ever to supersede the vigilant eye and manual constraint of a superintendent, who knows how to regulate and direct the movements in accordance with the laws of muscular physiology. In suggesting exercises and mechanical means, I have endeavoured throughout the whole of this work to confine myself to such as are of simple and practicable nature, easy to be understood, and to be procured with facility anywhere. But it remains with the surgeon to select for his patient, out of the exercises and mechanical aids enumerated, such as he may deem most suitable to the particular circumstances of the case he is treating.

bounds of decorum. A young person, beyond an age to be amused by games or childish pastimes, should exercise herself in any of the modes already pointed out; selecting such exercises as her surgeon may direct; or she may take instructions from a drill-master, or a teacher of calisthenics.\* Girls whose backs are feeble, or in whom there exists any inclination of the spine to one side, should be permitted to recline while learning and repeating their lessons; the chair, already figured (page 53), being the best and simplest that can be used for the purpose; and if additional support to the spine be necessary, it can be given by the use of dwarf crutches fitted between the seat of the chair and the axillæ of the patient, and strapped round her waist. Such a contrivance, if there be no very marked muscular feebleness—is preferable to the supine position on the reclining couch; not only as it admits of the patient engaging in almost any occupation, but because it is in no way fatiguing to the eyes,—an inconvenience all persons experience who read for any length of time while lying on their back. But, under all circumstances, the alternations from mental application to physical exercise should be frequent during the day. Neither

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\* For school use, the little book on *Calisthenic Exercises*, by Donald Walker, is an excellent work.

should the *passive* exercises of rubbing, kneading and shampooing the back be omitted, as they serve to invigorate the circulation in the deep-seated muscular and ligamentous systems. In cases of lateral deformity, such means should be had recourse to twice a-day—morning and evening—for the space of a quarter of an hour, or more, on each occasion.

When necessary, for the purpose of admitting of the application of lateral pressure, the simple crutch supports, passing between the axillæ of the patient and the seat on which she rests, may be made much more efficient if braced together in the manner here represented. When the apparatus

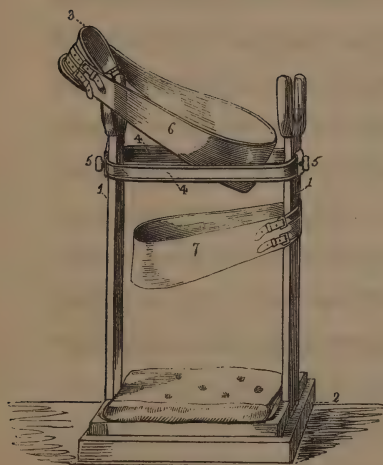


Fig. 1.



Fig. 2.



is so arranged, it may be called, by way of distinction, the *Braced-Crutch Support*.

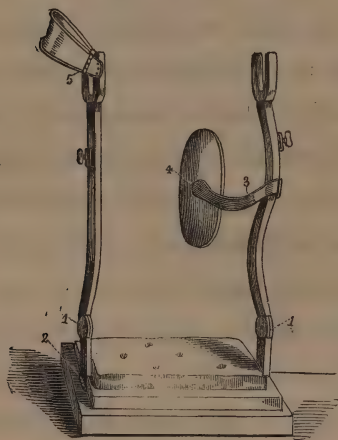
This contrivance consists of two straight dwarf crutches (Fig. 1, Nos. 1, 1) made of the necessary length to fit between the axillæ of the patient and the seat to which they are attached; (2) their extremities are to be hinged close up to the sides of the pelvis; and, if the width of this latter part of the body be greater than that of the back, measured across from one axillæ to the other, the crutches ought to be somewhat hollowed out at their lower third, so that they may fit exactly, without compressing the pelvis. On the other hand, if the spinal inclination be considerable and the ribs bulge out much to one side, it may be requisite to meet this difficulty by hollowing out, or slightly curving, the upper third of the crutch that corresponds to the prominent side. The higher ends of the crutches are kept asunder by means of two elliptical braces (4, 4), made either of wood or iron, which are to be slipped into sockets formed for their reception, and screwed to the uprights (5, 5). These braces, of course, can be taken out and replaced at pleasure. Should the patient wish to use the reclining chair along with the crutches, the posterior brace can be withdrawn. If the case be one that will admit of lateral pressure being advantageously applied, the trunk of the body is to



be lashed to the two uprights in the manner represented in Fig. 2, by means of girths (6, 7), made of ticking, or any other strong unyielding material suitable for the purpose. The counter-pressure, as shewn in the drawing, may be made on a movable metal-shield (3), passing over the shoulder from the anterior to the posterior horn of the crutch; but if the shoulder be higher than its fellow, and it be desirable to let the counter-pressure fall on it, instead of on the shield, the latter can be easily removed.

Should there be much rotation of the spine in the dorsal region towards the right side, so as to render the angles of the ribs very acute, and cause them partially to cover and conceal the transverse processes of the vertebræ, pressure by means of the band will be improper. In order to make the pressure in such cases correspond with the axis of the deformity, a powerful spring (3),—vide engraving on next page,—furnished with a padded shield (4), may be attached to either of the crutch uprights, and so arranged that the line of pressure may bear in any direction required. For the convenience of anterior inclination and reclination, the “*braced crutch*” may be furnished with a circular hinge (1) near its base; and for the purpose of letting the sides fall a little for the accommodation of the patient when taking her seat, the

lower part of the crutch should be hinged to the seat (2). If the thorax project much to one side, or the pelvis be large, it will be also necessary to



curve one of the crutches as is here represented.\* The spring can be affixed to either upright; behind, or in front of the body, as circumstances may require. The "*braced crutch*" can only be used in the house, and while the pa-

tient is at rest, or in a sitting or reclining posture. On walking out it will be necessary to substitute one of the supports delineated in page 131. Fig. 1 is that which I usually prefer. It is the simplest, and if covered neatly with black leather, can be worn over the dress, and easily concealed by means of a shawl. When, in addition to lateral curvature, there exists an inclination of the spine forwards, conjoined with inability on the part of the patient

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\* When the crutch requires to be shaped in the manner represented, it ought to be made of metal, or ash-wood, warped by immersion in hot-water, and afterwards bent to the necessary form.

to rectify it by muscular effort, another kind of support has been recommended as more appropriate. It consists of a pelvic base, from which arises a firm spring that runs from the sacrum to the lowest cervical vertebra; to each side of the upper part of this spring are attached arm supports, to serve instead of crutches, which pass under the axillæ, and, rising in front of the shoulders, press against the acromion processes of each joint. The dorsal upright is also furnished with spring side pieces. Figs. 1 and 2, of the annexed wood-cut,

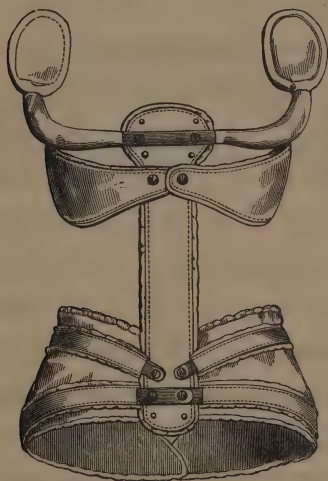


Fig. 1.

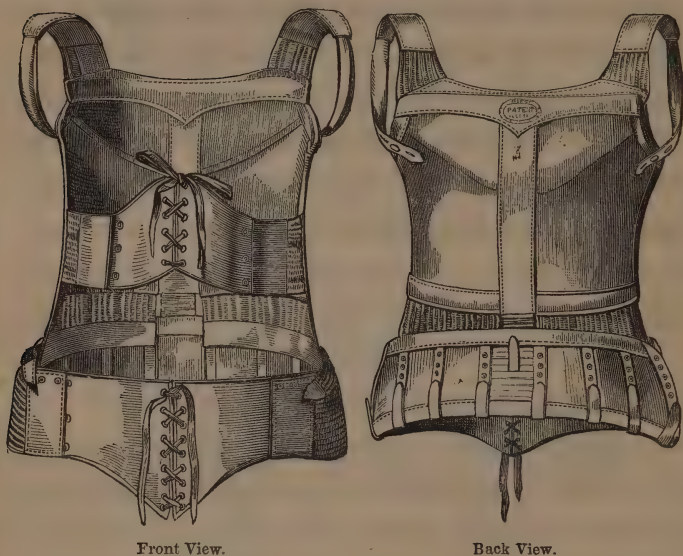


Fig. 2.

will explain the construction of this apparatus, and its mode of operation, without further detail.

I may here also notice the stay invented by Mr.

Bigg, of Leicester-square, which he has denominated "*Orthospinalis*." It possesses certain advantages which render it perhaps the best spinal support of any yet proposed.



Mr. Bigg having favoured me with a description of this apparatus, I shall here introduce it in his own words:—

“The *Orthospinalis* is constructed in accordance with the well-known principle, that if the body be continually inclined to one side, the muscles on that side will gradually become contracted, and a curvature of the spinal column ensue. As the muscles on the side of inclination

contract at the expense of the opposing muscles, if a machine be constructed which will by mechanical force urge the body over towards the opposite side, the contracted muscles will then, in their turn, become elongated, and an exertion of the spinal column follow; so that, in fact, the same means which originally produced the curve, are taken to cure it. To effect this, it is exceedingly important that a firm and equal bearing should be obtained upon the pelvis, which is gained by the upper part of the machine revolving on a central joint, so that on whatever side the inclination of the body be, that part which encircles the pelvis is always in a perfectly horizontal position. Another important point is, the regulation of the urging power, so that the cure may take place almost as gradually as the formation of the curve, and a continued influence be maintained. This is done by having two pieces of broad and powerful elastic web attached at one extremity to the upper part of the machine, and at the other to the lower by a row of fastenings, arranged in such a manner as to admit of the machine being impelled over to the right or left side, as the necessity of the case may require. Another advantage is that derived from part of the apparatus taking its bearing beneath the axillæ; the spine is supported at the same time as the muscles are being employed to



straighten it, so that the slightest influence obtained by the muscles is turned to account by the perpendicular support afforded to the spinal column. As a crooked column is always shorter than a straight one of the same quantity, there is a provision made in the machine, by means of a spring and rack, by which it affords the same support to the spine as it becomes straightened, as it did in its original state, by increasing the distance between that part enveloping the pelvis, and that which takes its bearing beneath the axillæ. It is likewise so adapted to the anatomical form of the human body, that all the depressions are effectually concealed, and the heat arising from the padding to support the cloth obviated, whilst its utility remains unimpaired."

But whatever support the patient wears out of doors and while walking,\* should be removed on her return home, and the "*braced crutch*" substituted in its stead, in order that the weight of the arms, etc., may be transferred from the pelvis to the seat on which she rests. While using the braced crutch, also, she can have the advantage of pressure applied to the projecting angles of the

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\* It may here be observed, that no *special* exercise of any kind ought to be taken while the patient's movements are constrained by mechanical means.

ribs; provided the rotation of the spine be not so great as to render pressure at this point injudicious.\* The curve in the lumbar region, however, may, in almost every instance, be benefited by the use of the transverse strap (fig. 2, p. 201,—<sup>7</sup>). As regards the use of artificial supports and the application of pressure in general, no specific rules can be laid down. The same means are neither proper at all times, nor capable of being adjusted in all cases. Every example of deformity of the vertebral column must be treated, both mechanically and physically, with reference to its own peculiarities; and the invention, or alteration of any apparatus, as well as the propriety of its use, must be left to the judgment of the surgeon, who ought to adapt his means to meet the peculiar difficulties he has to combat.

Before quitting this subject, I may advert to another contrivance, designed for the purpose of affording support conjointly with lateral pressure, invented some years ago by a French practitioner of the name of Hossard, and described as “*a lever belt with inclination busk*.” This apparatus was afterwards adopted by Dr. Tavernier, who pub-

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\* The position imparted to the ribs by rotation of the spine, and the difficulty of applying pressure in severe cases of this kind, will be discussed in Chapter VII, Part II.

lished an account of it, translated in 1842 into English by Dr. Brewer. Judging from the report of the commission appointed by the Royal Academy of Paris, consisting of MM. Breschet, Amussat, Orfila, and Cruveilhier, to determine the claims to merit possessed by this invention, there is every reason to believe that it does not answer the expectations raised in its favour. As, however, this "*lever belt*" has still its advocates, I have here inserted an engraving of it, copied from

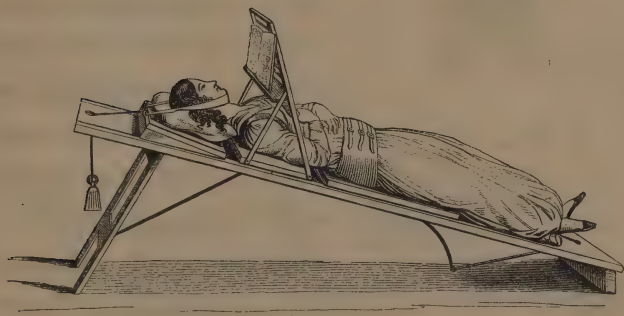
that to be found in Dr. Brewer's translation, which will enable the reader easily to comprehend its mode of application and the principle of its action.



In some instances, such may be the feebleness of the patient, that a perfectly supine posture is desirable. For this purpose a simple plane,

inclining somewhat from head to foot, just sufficiently to keep the spine straight, without inconvenient extension of the column, is requisite; an air

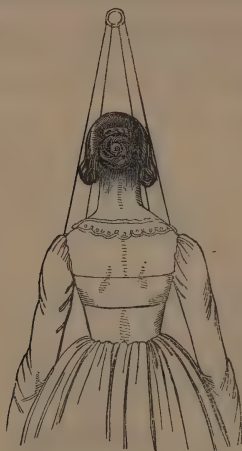
pillow should be placed under the patient's head, and a supporting strap under her chin, to prevent the body slipping down. In general the inclination of the plane need not exceed three or five degrees. But if the deformity be considerable, provided no general feebleness exist, the plane may incline somewhat more; or, a certain amount of extending power may be applied to the pelvis; this part being supported on a sliding rest, as here represented. The whole apparatus is known as the "*sliding plane*," first suggested, I believe, by Mr. Shaw.



The portion on which the shoulders rest in this diagram is a fixture; that on which the nates rest, and to which they are strapped, by a broad band passing round the iliac bones and over the trochanters of the thighs, is placed on four small rollers, and movable; so that, in proportion to the degree of inclination imparted to the plane, there

is exerted a tractile force on the spinal column. The shoulders are fixed by a padded arm-piece which passes across the back, at which part it is flat and unyielding, and up under each axilla, where it is soft and rounded. The mode of applying this strap will be immediately seen by reference to the annexed outline.

The two ends of the shoulder-straps, thus applied,



are to be brought together and slipped over a hook at the end of the plane underneath the head piece. The portion of the plane on which the head rests may also be put on rollers, or retained a fixture, as may be most suitable to the particular circumstances of the case.

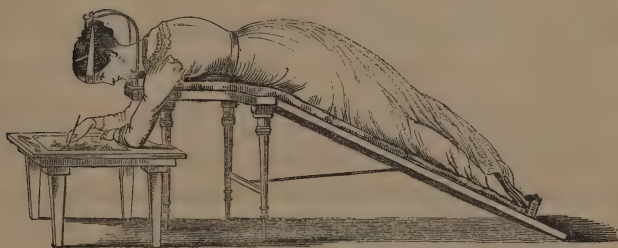
Should we wish to extend

the cervical portion of the column, a weight is to be attached to the head-piece, by means of a cord passed through a pulley at the upper end of the plane. The patient's head may be afterwards raised to a convenient position for reading, by inserting an air cushion under it, which, by means of an elastic tube and stop-cock attached as a mouth-piece, can be inflated or flattened at pleasure. When a



more considerable extending power is desired, a cord fastened to the lower end of the inferior sliding portion, may be passed through a pulley at the foot of the plane, and fixed to a spring underneath; that used as a common door-spring answers every purpose.

Some practitioners, of late years, have much extolled the efficacy of the *prone* position. It was strongly advocated by the late Mr. Verral, who contrived a couch or plane for the purpose, of which a delineation is subjoined. The head and elbow supports are an addition of my own, which I have found useful.



When the sternum is not depressed, there is no objection to the alternation of the prone with that of the supine, or lateral position; but when the ribs are twisted, in consequence of the rotation of the spine, or when they are in any other manner deformed, so that the cavity of the chest is diminished in its antero-posterior diameter, such a position is manifestly improper. If the

deformity of the thorax assume the projecting and conical form of "chicken-breast," the couch in question is useful. The prone position is, also, for the most part unobjectionable in cases of *ex-curved* connected with disease of the vertebræ.

At an early stage of curvature a very slight degree of extending force is all that is necessary; the mere slipping down of the body on the plane is sufficient to keep the spine on the stretch; and this is not productive of any annoyance to the patient. We must in all cases be careful neither to overdo the extension, nor to unnecessarily compress the bones of the pelvis (more especially if there be reason to believe that they are softer than natural), otherwise we may deform them.\*

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\* In severe cases of lateral deformity, in which it is of great importance that a supine horizontal position should be very constantly observed, certain contrivances may be used to enable the young person to carry on her education while confined to the plane. It will immediately suggest itself that a table may be made of a height sufficient to cross over the chest of the patient; which, by making the legs in front somewhat shorter than those behind, becomes a convenient desk, if the inclination of an ordinary writing-desk placed on the table be not found sufficient. The use of an ordinary reading-frame and similar contrivances will also readily suggest themselves. But sometimes, especially if the girl be destined to pursue music as a profession, we are requested to suggest a means by which her daily practice on the piano can be retained. This may be done by desiring a carpenter to turn four legs of common inexpensive

Should we find that the curvature of the column is not likely to be redressed by the simple mode of extension above explained, we must apply splints in the same manner as we would do to a crooked leg or inwardly-inclined knee. But there is often a difficulty in doing this. Such indeed may be the contour imparted to the chest by the twisting of the spine and the deformity of the ribs, that no means can be successfully employed to make pressure without, at the same time, the unavoidable counter-pressure proving injurious;—especially if the opposite point of the trunk be made that on which the counter-pressure rest; as the part opposite to that which it is desirable to compress, is usually itself equally deformed in a contrary direction, perhaps sunken in proportion to the projection we wish to remedy. In cases, therefore, in which we wish to apply pressure, we should always, if possible, let the counter-pressure rest on a support that is *in-*

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wood, to be substituted for those of mahogany. These ought to be considerably longer than the ordinary legs of a piano, so as to admit of the instrument being raised to a sufficient height to cross the body of the patient. The front legs must be shorter than those behind, that the key-board of the instrument may fall conveniently under the hands of the player. It need scarcely be observed, that the piano used for such a purpose must be a common square one. (The hints for the above adaptation were given me by Sir Charles Clarke, Bart.)

*dependent* of the body ; or, on points that cannot be injured. The hints already given on this head when describing the “Braced Crutch,” equally apply to the adaptation of pressure when the patient is in a supine posture. By a very little alteration in its mode of adjustment, the “Braced Support,” with its pressure-bands and springs, may be used equally well in the reclining and supine, as in the upright position of the body.

As cases requiring to be treated in the manner just described are often aggravated by some imperfection in the composition of the bones, they may be regarded as forming the connecting-link between ordinary and rachitic curvature. Their constitutional treatment, therefore, will perhaps be more properly considered hereafter. Indeed, the management of ordinary lateral curvature might have been given much more in detail, but I deemed it unnecessary to do so, because what remains to be said on this subject will be better introduced when we come to consider the treatment of deformity, complicated with rachitic softening of the bones.

Before quitting the subject I must not omit to notice the plan, lately proposed by Monsieur Guérin, of Paris, to facilitate the restoration of cases of lateral curvature,—namely, the subcutaneous division of the muscles, tendons, and aponeurotic expansions

of the contracted side, both in the interscapular and in the lumbar regions, by which it was supposed that a very important obstacle in the treatment might at once be overcome. From inquiries I have addressed to those who have practised this operation, or who have witnessed the result of it in Monsieur Guérin's hands—as well as from my own observation—it appears to me that the advantage is not commensurate with the untoward consequences that occasionally follow it.

In cases of long standing, we must recollect that it is not the muscles and tendons alone which prevent the parts being restored to their normal relations; but the changes that have been produced in the figure of the intervertebral cartilages, and sometimes in that of the vertebræ themselves, as well as the shortening of the articulating ligaments, etc. Though the division, then, of the dorsal muscles, may assist in restoring the spine to its natural form, it does not afford a degree of advantage commensurate with the risk incurred from the operation.

When, however, there exists a considerable curvature in the lower portion of the spine, and the lumbar fascia is much contracted and tense, its subcutaneous division may be practised with perfect safety and advantage. In one example in which I divided this aponeurosis, the lumbar



curve yielded immediately, in a considerable degree, to a comparatively slight extending force; and due advantage being afterwards taken of the step thus gained, a much straighter spine was ultimately secured than, in all probability, would have been obtained, without the operation.

This, also, seems to have been the result of the operations performed by Mr. Skey, at St. Bartholomew's Hospital:—"Divide," says he, "the tendinous cord formed by the insertions of the longissimus dorsi and sacro-lumbalis muscles, and the loins become straight in an exceedingly short period of time; and, as the loins present, in the large majority of cases of disease, the first indications of its presence, and the direct and certain causes of its upper curvature, so it is that the successful treatment of the lumbar occupies the direct path to the cure of the remaining part."\* In suitable cases, then, I am of opinion that a subcutaneous division of the fascia lumborum may be of advantage. This limited operation, moreover, is not attended with any risk, and certainly with very little pain or suffering to the patient; and the subsequent mechanical and physical treatment is thereby

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\* *On a New Operation for the Cure of Lateral Curvature of the Spine, with Remarks on the Causes and Nature of that Disease.* By C. Skey. London, 1841.

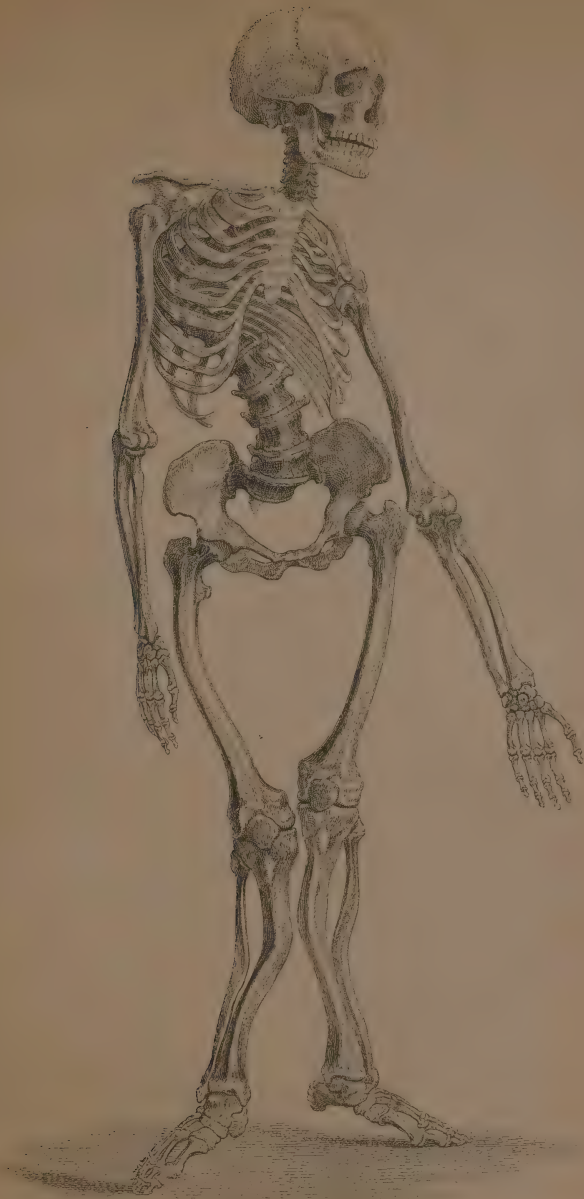
much facilitated. The fascia, however, should not only be divided transversely in its *full extent*, but perpendicularly in the direction of the spine also, so as to separate its attachment from the spinous processes of the vertebræ.

#### DEFORMITY OF THE THORAX.

As the vertebral column loses its perpendicular, but more especially as it becomes rotated on its axis, the direction of the ribs, it has been shewn, is liable to be deranged, and thus to create deformity of the thorax. If, in addition to an alteration of their direction, the ribs be themselves misshapen, the resulting deformity, it need scarcely be observed, will be greater and more difficult to counteract. Deformity of the thorax, however, is not always connected with curvature or distortion of the spine; it may be limited to the ribs, — especially their cartilaginous portion; and sometimes the sternum alone is misshapen. Such cases are very frequently of congenite origin, and may be considered as indicating a rachitic habit of body; being for the most part complicated with the general symptoms that mark the rachitic diathesis.

When deformity of the thorax occurs in conjunction with lateral curvature of the vertebral column, the cavity of the chest is usually dimi-

nished in its antero-posterior diameter, and the exterior contour of its parietes presents a flattened appearance, being twisted at the same time towards one side,—generally the right; one mamma, when the deformity occurs in a female, seeming to be diminished in size, while the other is in proportion thrust forwards, and apparently enlarged. The sternum is sometimes depressed in these cases below the line of the costal cartilages, and the angles of the ribs on one side, usually the right, are thrown considerably beyond the level of the spinous processes of the vertebræ, and acutely bent, so as to present a marked projecting outline, that is very liable to be mistaken, by those who are not familiar with the appearance, for the spinous processes themselves. The ribs of the same side, especially those attached to four or five of the middle dorsal vertebræ, are separated from each other; while the corresponding ribs on the opposite side are in proportion approximated. The general twisting of the thorax towards one side depends mainly on the degree in which the spinal column is rotated on its axis. The whole of these changes are illustrated in the case of M. A., page 170, and in the annexed engraving, which represents the anterior view of the skeleton that forms the frontispiece of the present volume.

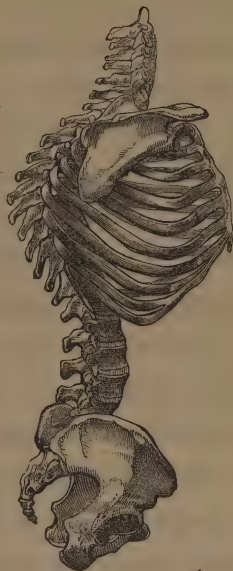


W. Baeg ad nat. del. et sculp.





When the spine is *excurvated*, as here exemplified, instead of being curved laterally, the deformity of the thorax presents characters very different from those just detailed. In this case the sternum is usually protruded, and the cavity of the chest is contracted in its lateral diameter. Its parietes are often flattened or compressed by the weight of the arms falling against the body; or they are otherwise deformed by the action of the muscles; so that the whole costal cartilages may be huddled together and protruded forwards in form of a cone. The shape thus produced, presents somewhat the appearance of the prow of a boat, or the breast of a bird, and the deformity is known by the names of *conical* chest, *chicken*, and *pigeon* breast. In severe cases, the shoulders are much elevated, and the head seems to sink in between them, so as to rest on the upper part of the thorax, causing the neck to appear unnaturally short.



In all cases of deformity of the thorax, and more especially in such as are connected with spinal distortion, the functions of the lungs and

of the heart are liable to be performed in an imperfect manner. Hence such patients are often affected with paroxysms of dyspnœa, palpitation, and hæmoptysis.

*Treatment.*—The management of misshapen thorax depends much on the kind of spinal deformity with which it is connected; the treatment proper for the latter being in general calculated to benefit the irregularity of the ribs.

Under any circumstances, the misshapen parts may be moulded by daily manipulation calculated to restore them to their proper form; and, in cases of conical thorax, the use of weights and compresses may often be had recourse to with advantage—more especially when the spine is exempt from deformity. Bags of shot or sand may be laid over the sternum or other projecting parts, when the patient is in a reclining or supine position; or pressure may be applied, by means of steel springs, when the body is in an upright position. But, as in all instances of costal deformity, the mechanical apparatus requires to be suited to the particular circumstances of the case, no very precise means, of general application, can be pointed out; they are, however, all simple, and will readily suggest themselves to every intelligent practitioner.

In cases of “chicken breast” and depressed sternum, the intercostal muscles, and those con-

nected with the anterior part of the chest, should be frequently put on the stretch, “by placing the patient in a standing position, with his back against a cylindrical piece of wood, and the arms extended. By this means an extension of the pectoral muscles is produced, and they are then brought into full action upon the ribs, as well as the muscles of the abdomen. While in this position the patient should be desired to make deep inspirations.”\*

The first mode of using the dumb-bells (as already explained, p. 41), is an excellent exercise in cases of chicken-breast, especially when uncombined with spinal deformity ; and the efficacy of the exercise will be much enhanced if the arms be held up by a circular support, such as that here represented,



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\* Ward, *Op. Lit.*

while the front of the thorax is, at the same, judiciously compressed by an assistant, on each occasion of the arms being thrown back. The compression may be made with the hands, or by means of a shield properly padded, and of a shape suited to impart the form that it is desired the chest should assume. Dupuytren was in the habit of recommending, as an exercise in malformation of this description, that the patient "should raise a weight suspended to a cord passed through two pulleys, by the aid of the arms and hands, during several hours daily. The end of the cord to be grasped should be fastened to the middle of a lever, to be taken hold of by the two hands, the other extremity supporting a weight proportioned to the strength of the individual. The individual standing upright, or even rising on tiptoe, to reach the lever placed at the extremity of the cord, seizes it with both his hands, and, employing the power of the muscles of the fore-arm, arm, neck, and chest, to bend the head, chest, and body, downwards at the same time, must raise the weight at the other extremity of the cord, and alternately employ the flexor muscles to raise the weight, and the extensors to straighten the body. If it be true—and there is no doubt of it—that there exist between the bones and muscles relations of conformation and action, so that the latter always

tend to act upon the former in such a manner as to bring them to their first and fixed shape; it is certain that the exercise just described will, by directing the efforts of the muscles upon the bones of the chest, gradually bring the sides of this cavity to an improved form.”\*

The game of “*La grâce*”, played with the *elbow joints at full stretch*, and the arms well extended,—so that the player may throw the hoop to the greatest possible distance—is likewise well calculated to effect the same purpose; and, for young ladies under a certain age, affords at the same time amusement as a pastime. For young men, rowing, swimming, and archery, are also appropriate exercises.

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\* Coulson’s translation,—vide p. 30, in his *Observations on Deformity of the Chest*.



## APPENDIX.

THE reader will oblige by introducing the following curious and highly interesting case at p. 137. It is remarkably illustrative of the truth of the observations there quoted, from Dr. Watson's *Practice of Physic*, in reference to the circumstances connected with spinal curvature produced by the contraction of the thoracic parietes, that usually follows collapse or shrinking of the lung of one side, after pus has been evacuated from the cavity



A



B

of the pleura. When the portion of the present volume alluded to was passing through the press, the case was accidentally omitted.

E. T., a boy of rachitic constitution, now fifteen years of age, was, when two years old, affected with acute inflammation of the left pleura, supuration followed, and the pus formed an opening for itself at the junction of the cartilages of the eighth and ninth ribs, somewhat below the scrobiculus cordis. A considerable fistulous opening — of which the cicatrix is still visible — was formed, from whence matter continued to be discharged for several weeks; the lung of the affected side in consequence shrank, and became useless. The costal parietes of the left side of the thorax, in gradually contracting, to accommodate themselves to the diminished size of the collapsed lung, forced the heart almost wholly into the right pleural cavity. The thorax on the right side is now greatly enlarged in capacity, not only on account of the addi-



tion thus made to its contents, but also, it may be presumed, from the lung of that side being unusually developed, to compensate for the useless condition of this organ on the opposite side (vide fig. c). The boy's breathing is very laboured, and carried on principally by the abdominal muscles. The relative height of acromion process of each shoulder differs from that usually observed in examples possessing the physical peculiarities of the present case; for notwithstanding the great sweep the column makes towards the right side in the dorsal region, and the elevation it thus imparts to the corresponding scapula, by causing the ribs under this bone to bulge out in an unusual manner, still the acromion of the left side is the highest.

This apparent anomaly is owing to the curve in the lumbar region being extremely marked, which, combined with the general feebleness of the column and its musculo-ligamentous appendages, allows the right side of the thorax—which is out of all proportion in size and weight to the left—to sink on to the right ilium, and thus indirectly to raise the left shoulder. The position in which this lad usually stands, with his head resting on his left shoulder, is also characteristic. In this manner, he counterpoises the hanging weight of the right side of the thorax, and is enabled to

maintain his equilibrium, so that the centre of gravity falls where it should do on the pelvis.

The boy is at present only three feet three inches in height, and a perfect child in mind; though not in any way idiotic; and although fifteen years of age he shews no signs of approaching puberty in his physical development.

END OF FIRST PART.

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